AMERICAN MACHINIST

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Weston's New Dynamo-Electric Machine and Arc Lamp.

In the economy of electric lighting the first consideration is the adoption of an efficient dynamo.

With steam engines the loss or gain of a small percentage of power is treated with marked indifference, but in electric lighting it has more weight. A generator developing 85 per cent. of the power expended in driving it, would warrant a lucrative business, whereas one developing but 75 per cent. might mean entire failure.

It is claimed that in recent tests of the improved Weston dynamo machine, herewith illustrated, a little upwards of 93 per cent. of the power used in driving the machine was converted into electrical energy to be utilized in producing light or reconverted into power.

The mechanical construction of this machine is very simple, as will be seen from the engravings. The frame consists of four pieces. Top and bottom pieces are solid castings, their ends forming the cores for the field magnets, while the heavy blocks in the center form the pole pieces. In the fitting up, the bottom casting is placed upon a horizontal boring mill and the pole piece bored out, after which the brackets upon either side are bored for the reception of the boxes without shifting the piece of work.

Thus the boxes are sure to come in line when placed upon the brackets, their surfaces having been turned off upon a mandrel. The upper casting is fitted up in the same manner as the lower one. Wire is wound upon the cores for the field magnets by special machines and apparatus. To make the box upon the driven side next the pulley more rigid, two braces and rods extend from it to the end castings as shown, thereby making a most substantial machine. In addition to the bolts at the ends there are two tapered steel pins placed between the bolts in the ends of each core piece with nuts upon their ends, by means of which they may be withdrawn.

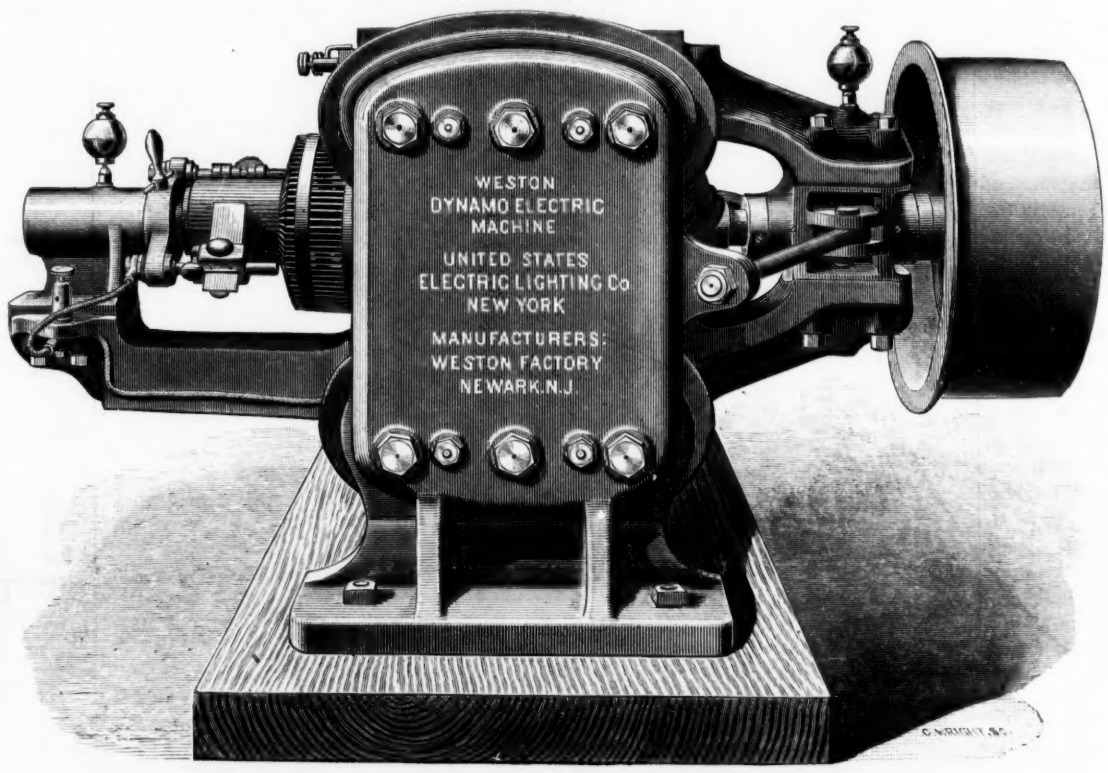
In putting the machine together these pins insure the parts coming together in precisely the same position as they were at first. End pieces are of homogeneous material, insuring a satisfactory magnetic condition.

The armature is of a peculiar form, designed by Edward Weston, who is among the pioneers if not the very first to make a business of electric lighting by the arc systems in this country. This sectional armature is composed of a steel shaft neatly turned, having a nut fitted upon each end of that part intended to hold the armature.

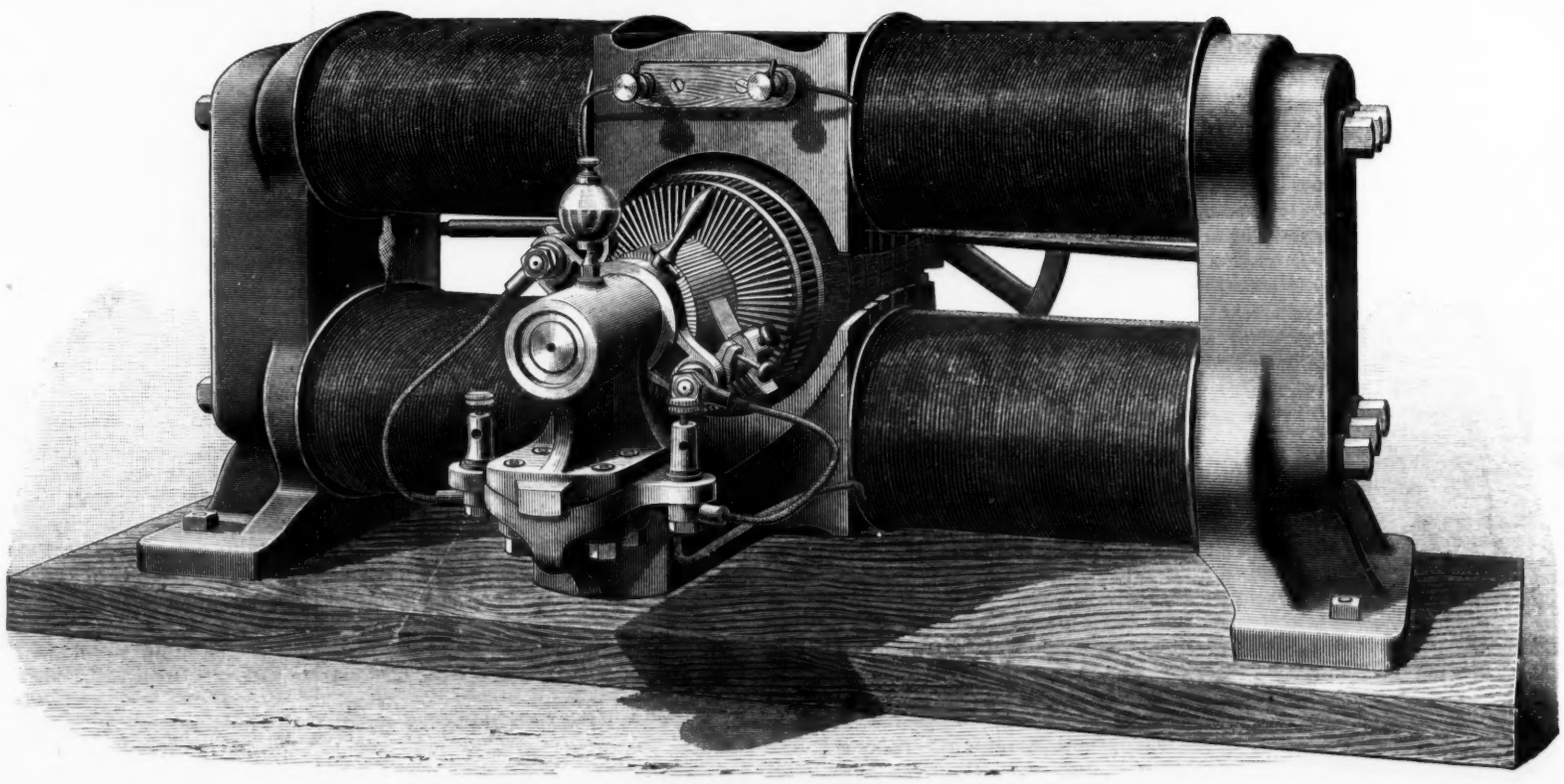
The armature is made up of soft iron discs about one-eighth inch thick. Their form will be readily comprehended from the engraving (page 2). Each plate has four holes in it, with a slit at each side. There are projections at regular intervals around the periphery between which the wire is to be wound.

In making up the armature, a heavy cast-iron plate with projections upon it, and holes corresponding to those upon the disc, is placed upon the shaft against the nut, after which the discs are put on with small paper washers between them. Finally a second cast-iron plate like the first is placed upon the shaft and secured by a nut. After this two plates of the form shown detached upon the shaft, are screwed fast to the ends of the core.

These plates have a large hub, leaving a space around the shaft to allow a free circulation of air. To further insure this circulation a strip of paper is placed in the slits in the plates, the slits being all placed in line. The object of this circulation of air is to cool the armature, as the lower the temperature the better the efficiency. The core is covered with paper, after which insulated copper wire is wound from end to end, as shown, with the ends of the wires all at one end of the core, where they are attached to the loops upon the commutator. This commutator is made up of alternate layers of



WESTON'S DYNAMO-ELECTRIC MACHINE—END VIEW.



WESTON'S DYNAMO-ELECTRIC MACHINE—SIDE VIEW.

copper and vulcanized fiber, with the ends towards the armature terminating in loops for holding the ends of the wire.

When finished, the layers of wire upon the armature are secured by bands of hard brass. By exceedingly careful workmanship, the armature is made to run between the pole pieces with a very small clearance.

The armature, while in motion, acts as a centrifugal blower, maintaining a rapid circulation of air, which prevents the parts from becoming injuriously heated. Thus it will appear that, by the construction of the armature, and by general electrical design and mechanical construction, the loss sustained through the formation of induced currents in the armature is entirely overcome.

The field coils are placed in a branch or derived circuit of high resistance, instead of in the main circuit, or, in other words, the current, as it comes from the armature, is divided in such a way that only a small quantity of it passes through the coils.

By this method the current is steadily maintained so that it would be represented by a straight line.

Another very essential feature about this machine is, that should a workman accidentally get into circuit with it, there would be little danger of losing his life, whereas with a machine producing an intermittent current, under such conditions, instantaneous death would be the result. By the arrangement of coils alluded to, a low power will sustain the fields, and the machine is steady in operation. Furthermore, the regulation of the machine is both easily and economically effected.

The current being regular and of uniform intensity, a steady light must, therefore, be the result. The regulation is entirely automatic, so that lights may be turned on and shut off, without the necessity of skilled personal attention to the mechanisms employed, and the power of the lights remaining will not be sensibly affected. The regulator is so sensitive that it will instantly adjust itself to varying conditions caused by suddenly turning on or off a large number of lights This regulator, while capable of satisfactory action, is very simple in construction.

The new arc lamp is constructed with special reference to comply with the requirements of the Board of Fire Underwriters.

One engraving shows the lamp open, and another closed. It will be observed, in the latter case, that there is no possibility of anything falling into the lamp, and no fire can fall out. It is wholly unaffected by dust of an explosive character that may be floating in the air. By opening the door the feeding mechanism is exposed, and by lowering the globe the carbons may be replaced. The globe is held by a bayonet joint to the upper part of the lamp, and in lowering slides upon the two rods.

The feeding mechanism is shown in a separate engraving. It has been remodeled, and is now constructed in a manner which is simple, yet insures the most sensitive operation. When closed, the dirt from street or buildings can in no way be deposited among the fixtures or in the globe.

The electrical connections are also inclosed, as cleanliness in these connections is very essential in obtaining successful results.

A peculiar feature of the Weston lamp is the shortness of the arc, or smallness of the distance between the carbons. In these lamps it averages about 1-32 inch, whereas in some other systems this distance is from 1-16 to 1-8 inch. This is one of the reasons why a current of low intensity can be so successfully used. The quantity of light produced is remarkably high, as has been shown by the reports of the official tests made at the Paris Exposition.

These dynamo-electric machines and lamps are made by the United States Electric Light Co., 59 and 61 Liberty street, New York. The system of lighting herein described has just been applied to the great Brooklyn Bridge. It is also extensively used in the principal cities and manufacturing districts throughout the country.

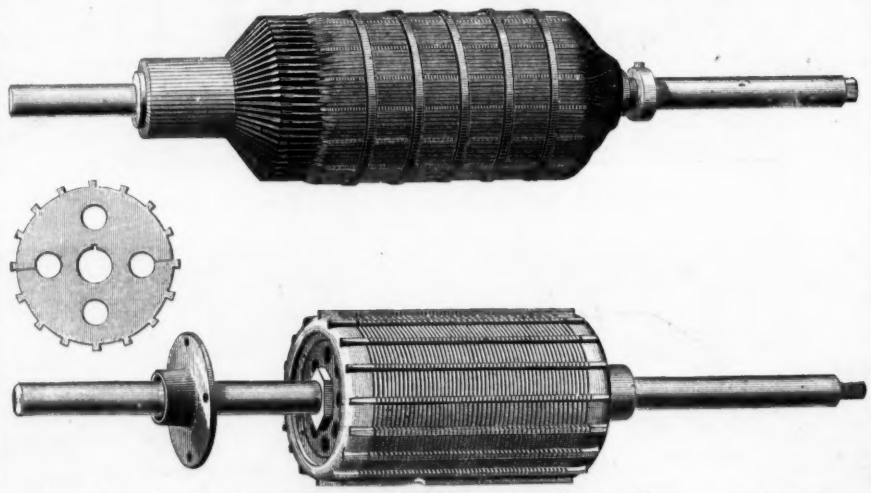
Extracts from Chordal's Letters.

THE SCIENTIFIC SYSTEM OF PRODUCTION—THE SEWING MACHINE AS AN EXAMPLE—DIFFICULTIES IN THE WAY OF APPLYING THE SYSTEM TO MAKING MACHINE TOOLS.

Mr. Editor:

* * * I have always had a great fancy for that style of productive business which could be reduced to a scientific system of regular, uniform, calculated output; and if I am not mistaken, I have in previous letters to you mentioned matters bearing upon this subject which I had picked up from people of experience.

MECHANISM OF WESTON'S ARC LAMP.



ARMATURE CORE.—ARMATURE AND COMMUTATOR.—SINGLE DISC OF ARMATURE.

The word "manufactured" really means hand-made, but in all modern uses of the term it is understood to mean exactly the opposite; that is, power production as distinguished from hand production.

By building a machine we mean constructing it by ordinary constructive processes, such as would naturally be employed upon that class of product when occasion required it, and by manufacturing in this connection is meant a system of production by peculiar facilities designed expressly for a given production.

This subject of manufacture, in the machine line, cannot be justly illustrated without going back into Yankee-land, where I may almost say the art itself had its origin.

* * * The sewing machine, while a very complex affair, is probably as simple and popular an example as can be chosen to illustrate the two methods of production. Assume that a man desires to have a sewing machine made. By this I mean one sewing machine. He gets his castings, and, naturally takes them to a machine shop, where there are skillful workmen. By skillful I mean men who are capable of putting a mark in the right place and of working close to the mark.

The sewing machine has a shaft in it. It is cut off in the blacksmith shop, centered in the vice, tested and straightened in the lathe, turned to fit the holes it has to go in, and tried in the holes to see if it does fit. A piece with six holes in it has the holes located by a skillful workman. One of the holes is drilled in the drilling machine. The next hole is of a different size, and the drill is changed for one of a proper size, and so on till the six are done. It is secured in the vise and has some holes tapped. Some piece to match, say, two of these holes, is laid against it, and some scribing done, and the drilling is done by the scribing marks. Sliding pieces are nicely planed, and finally filed, to a proper contact with each other. If two parts fit each other too tightly, a little is taken off of one part. Finally the machine is done, and, we may say, perfectly done. The cost may readily be imagined. The facilities involved have been lathes, planers,, drills, vises, files, and the closest kind of skill at every point.

* * * No fault can be found with this machine by reason of the manner in which it was constructed. That art which we call manufacture would not have been applicable to one machine, nor would it to two machines. That particular point at which this art itself became applicable is a point for fine determination.

Assuming that, after this machine is built, it is decided to build another machine, the same processes as with the first machine are repeated. The quality should be precisely the same. The cost should hardly vary at all. Another machine has simply been built.

Assume that the third machine is wanted. The same processes are used. The quality would be the same. At least, there seems to be no good reason why it should not be, because the first one was supposed to be as perfect as desired; but the cost will be slightly lessened, for one reason only, and that is the slight increase in the practiced dexterity of the workmen. But, still, it is questionable whether the decrease in the cost due to this fact would be appreciable in building the third machine, or the fourth machine, or the fifty-fourth machine, or the thousand and fourth machine, provided, of course, that they were built one at a time, without any association with each other. The tools get no better (or there is no reason why they should), and the iron gets no softer (at least, there is no reason why it should), and the only thing in favor of economy is this one feature of added practice.

* * * It might be said that, long before the thousand and fourth machine was built, a successful builder would have put in something like a gang-drill, which would drill three or four holes without having to change the drill, or a centering machine, to save punching the shaft in the vise, or some sort of a dog attached in the face-plate, which would grab this shaft while being turned. But it will be seen that no one of these facilities, which seem to be looked upon as extraordinary, would be justified by the construction of the single machine. These thousand and four constructions are, after all, but the filling of separate orders for one machine each.

* * * Now, notice the process of Yankee manufacture, as applied to this same machine, after the wisdom of a large production is determined upon.

* * * The first step in the process is the construction of what is known as the model. This word model hardly strikes me as being proper. I should say sample, but model is the word that is used. The model is simply a machine constructed without regard to how it is done or who does it, so long as it is exactly like the machine which is in future to be made. The highest possible class of workmanship is involved in the construction of the model. No pains or expense is spared. When it is done, it is tested as a sewing machine, and when found perfect in its operation, the model may be said to be complete.

The manufacturer now looks upon this machine and says: "If this machine is right and the thousand and four are built exactly like it, the thousand and four will necessarily be right also." So, the simple question is how to arrange matters so that the thousand and four machines will be exactly like this model.

He goes into detail. He pulls a little piece out of the machine, and says to himself: "This piece is exactly right for that model. If I make a thousand and four pieces exactly like this, all of them will be exactly right for that model. The problem is to so arrange matters as to make the thousand and four pieces exactly like this little piece."

He looks at a knob on the end of this little piece, and says, "If this knob is all right, all I have to do is to arrange matters to make the other knobs exactly like this one."

By this system of analysis every piece, and every detail of every piece, is brought under the same head of a mere item to be identically reproduced in numbers.

* * * One thing should be said in regard to the construction of the model. The model must represent something more than a sewing machine. It must be more than a contrivance which will sew and sew properly. Every piece, and every detail of every piece about it, must be of such a character and form that the manufacturer, when he reaches it in his analysis, can say to himself, "It is possible to so arrange matters as to be able to duplicate this thing a thousand and four times with absolute certainty." A detail in the model which justifies the manufacturer in saying, "This thing forbids identical duplication," is a defect in that

model fatal to the successful manufacture of that machine.

* * * I have been informed of many sewing machines, and analogous devices, which have possessed peculiar merit for the purpose for which they were intended, but in which the omission of this adaptation of parts to a proper system of manufacture has positively forbidden the investment of capital in an attempt to put them on the market.

* * * Should manufacturing defects appear in the model, a change must be made in that part in which the defect exists. Then the question arises: "Does this change, made for the sake of manufacture, materially affect the qualities of the device as a part of the sewing machine?" These matters must all be definitely settled, and the perfect model—perfect as a sewing machine and perfect as an article of manufacture—all completed and approved before the real system of manufacture comes into earnest consideration.

* * * In building one of these sewing machines, it is immaterial whether a certain little casting takes ten minutes to be moulded or whether it takes twenty minutes. The difference in cost will be trifling in comparison with the cost of the entire machine; but in this manufacturing scheme the cost of the entire machine must be a trifle, and it is a matter of a great deal of importance whether the aforesaid casting can be moulded in 10 minutes or 9½ minutes.

The question comes up whether the casting can be gated, and whether only two can be gated together or 50. The question of how much it costs to smooth off the gates comes into play, as does also the question of shrinkage, chilling of the castings, warping and capacity to be properly pickled and annealed. All of these things count for much.

Here it will be seen that the man who knows something about manufacturing must have the privilege of dictating the form of machinery to the man who knows something about sewing machines; and if the two cannot agree, the machine can never become a real article of manufacture.

* * * It having been determined that the model represents a machine that will sew properly, and also a machine which can be manufactured properly, the next step is to provide means by which to compare the new work with the model.

A certain piece is taken from the model, and it is necessary that in the new work a certain hole shall always be the exact size of a certain hole in this piece of the model. Before any steps are taken to produce the new hole means must be provided for measuring the new hole. The means is simply a limit gauge. It being determined that all these pieces must not vary more than the half a thousandth of an inch from the size of the hole in the old piece, a gauge plug is made having one end half a thousandth of an inch larger than the other end. This gauge plug is made regardless of expense. All of the new holes are to be tested by it, or more properly by another gauge plug made from this one, the original being kept as a test gauge plug only.

If the little end of this plug won't go in the hole, the hole is too small. If the big end of this plug will go in the hole, the hole is too big. Gauges of this general character are to be made for every hole, and gauges constructed upon the same general limiting principle of "too big" or "too little" are made for every dimension of every piece about the model.

* * * In the case of a sewing machine, the procedure as thus far referred to will have involved enormous expense. A person who has never seen a set of test gauges used upon such work (to say nothing of a duplicate set of gauges, and perhaps a triplicate set) has no conception of the cost involved. Personally I have had no experience with this class of work, but I will venture to make some figures, qualifying them by stating that they are mere hap-hazard guess work based on an ordinary inspection of the things.

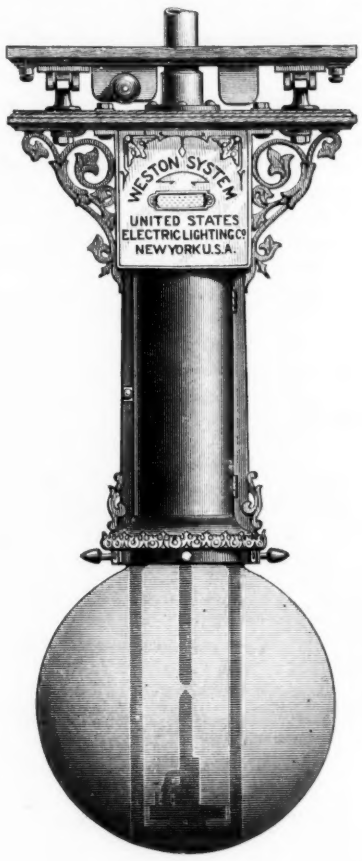
I would say that in an ordinary sewing machine, arranged to be manufactured in the modern manner, the model would represent a mechanical cost of, say, three thousand dollars, and a fine set of triplicate gauges a cost of twelve thousand dollars.

Here we have a good deal of money expended, and still we have nothing that looks really like manufacturing machines. No provision is made to cut a surface, or to drill a hole, or to polish a pin or to bend a wire.

* * * After determining what is to be made, and having provided the means for determining whether the new thing is like the thing determined upon, it is now in order to devise means for the most economical and certain production of the new work. To even hint at this part of the subject would take many of these letters, and as I have spoken of the thing thus far simply to illustrate a point, I will say nothing of the means for actually doing the work.

* * * We often hear fine mechanics in their day-dreams speak of ordinary heavy machinery being manufactured upon this modern plan of duplication. If the subject be considered from this sewing machine operation as a standpoint, it will at once be seen that so long as this world exists we may never expect to find an establishment, engaged in a varied line, carrying out this modern system of operation.

In the sewing machine factory we see two

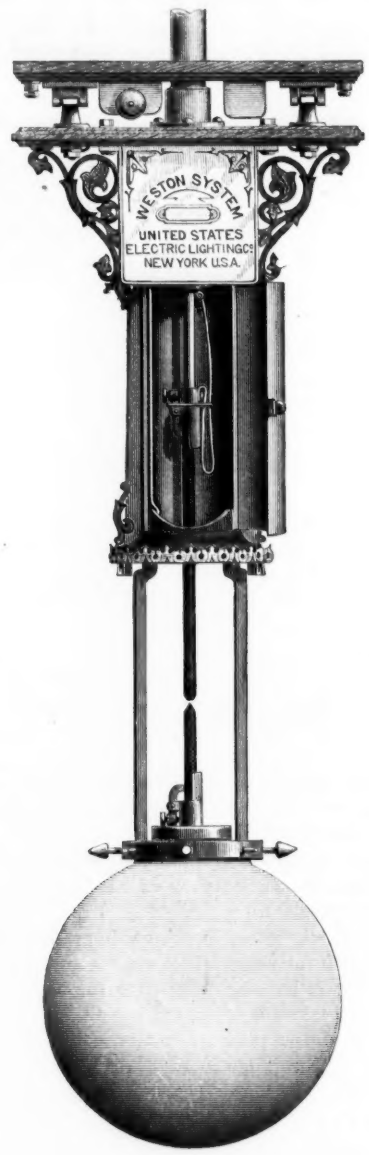


years spent upon the construction of a model; and two years spent upon the elaboration of a set of test gauges; and then a year in planning the shop facilities; and then, say, two hundred thousand dollars invested in marvelous special machines, each of which may be adapted only for a certain peculiar dig into a certain peculiar piece. This fancy shop, when done, will be fitted for making one commercial article only; and the commercial article is a sewing machine like the model.

* * * Now, consider heavy machine construction. I take for example the machine tool concern of Wm. B. Bement & Son, of Philadelphia. This concern builds a full line of iron working machinery. I know nothing exact regarding the matter, but I feel safe in saying that the product of this shop is represented by not less than 300 different machines, selling at from ten dollars to ten thousand, and weighing from ten pounds to one hundred thousand pounds, and made in quantities of from one to six.

Take as an example among its lot of machines a 30″ engine lathe. If the model of this machine were constructed upon the sewing machine plan, it would cost as much as five years' sales of these lathes would come to. A set of sewing machine test gauges for this lathe would cost as much as 25 years' sales of these lathes would come to. The special machines for constructing the parts of this lathe, if the sewing machine idea were carried out, would cost so much that there is no use in figuring it. The shop room taken up by these special machines would terrify a Texan. The interest on the cost of these manufacturing facilities would multiply the natural cost of the lathe by ten, while they may divide the natural cost of the labor by twenty, and a single change in the design of the lathe may knock the whole system endways. And how big a shop would it need be when manufacturing 299 other machines on this same plan!

* * * Tools which years ago were special, being designed for a special product, have, by some slight modifications, become more general in their character. They will do more than take a certain dig in a certain piece of a certain machine. They will



take that general character of dig in any piece of any machine. It is the lathe with its capacity decreased in one direction and increased in another; or the drill press which will not drill many kinds of holes, but it does quickly what it undertakes; it is the milling machine which will not do planing, but will do milling; it is the file, which is not flat on one side and round on the other, and with knife-like edges.

Very respectfully, CHORDAL.

A Californian, it is said, some months since discovered that the leaves of the eucalyptus tree could be used with success in removing scale from a boiler he used, and, having associated with himself a partner, they have since made extensive experiments, and, it is claimed, with the most satisfactory results.

Situations and Help.

The "Wanted" column of the present issue of the AMERICAN MACHINIST contains six advertisements of men desiring situations, and the same number of employers desiring help in various mechanical capacities, which would seem to be a favorable indication of the present or prospective state of business. Of the firms advertising for help, a Western shop wants a draughtsman; a Pennsylvania manufacturer wants a man skilled in making mandrels and furniture springs; a Canadian establishment wants a foundry foreman; another foundry foreman is wanted by a large Eastern wood-working machinery firm, a large establishment, manufacturing agricultural implements, wants a blacksmith foreman; while another very extensive concern, similarly located, needs a fully qualified man to act as superintendent of large shops.

Railway Exhibition Machinery.

A large and well-selected array of machinery is shown at the Chicago Railway Exhibition. At present our space permits nothing more than a reference to the kind of machines shown in some of the large exhibits.

Wm Sellers & Co., of Philadelphia, have a large space, in which the following machines are exhibited: One 54″ radial drill; one horizontal drill; one 45″ vertical drill; one 60″ boring and turning mill, with extra saddle; one drill grinder; one 48″ slotter; one 1,500 lbs. steam hammer; one 12″ lathe, bed 4′ 7½″ long; one 30″ lathe, bed 14′ 9″ long; one 36″x36″ planer, 10′ bed; extra saddle and two vertical slide rests; one 1½″ bolt cutter; one 90″ wheel lathe; one 50″ car wheel boring mill.

The Pratt & Whitney Co.'s exhibit comprises the following: One each 28″ and 52″ chucking lathe; one each No. 2 and No. 3 cutting-off lathe; one 15″ hand lathe, 6′ bed; one 18″ hand lathe, 8′ bed; one 13″ screw cutting engine lathe with taper attachment, 5′ bed; one 16″ screw cutting engine lathe with taper attachment, 6′ bed; one 21″ engine lathe, 8′ bed; one 27″ engine lathe; one tap lathe; one each No. 3 and No. 4 turret head bolt cutter; one No. 3 double head national bolt cutter; one No. 2 single head national bolt cutter; one No. 5 bolt cutter; one each 16″, 20″, 24″, 34″, and 40″ planers; one 10″ pillar shaper, with centers; one 14″ crank shaper, with centers; one 10″ crank shaper, with vise and centers; one Champion drill; one each No. 1 and No. 3 manufacturers' drills; one No. 2 upright drill; one each No. 1 and No. 3 power milling machines; one No. 2 screw shaver; one No. 3 screw machine, with tools; one No. 5 spindle vertical tapping machine; one bolt heading machine; one twist drill grinding machine; one cutter grinding machine; combination lathe chucks, from 4″ to 24″; full sets tools for chucking lathes; cutters for teeth of wheels; gauges for cutters; United States standard thread gauges, ¼″ to 1½″, hardened and ground, with templets for same; single and double-end plug and ring gauges; sets hand and machine taps; stay-bolt taps; taper taps; a set of Wm. Sellers & Co. hob taps; pipe taps; Hoopes & Townsend die taps; Nos. 0, 1, 2, 3, 4, and 5 die stocks and dies; pipe tap reamers; set taper reamers; set short shank hobs; Renshaw patent ratchet drills.

J. A. Fay & Co., of Cincinnati, exhibit the following wood-working machines: No. 2 large car sill and timber-dressing machine; automatic car gearing machine, with boring attachment; vertical end tenoning machine; No. 8 lightning flooring machine, six roll, 14″ double cylinder; No. 5 large moulder to work four sides 12″ wide; radial reversible boring machine and cutting-off saw; No. 6 car mortising and boring machine; automatic knife-grinding machine; "D" Universal wood-worker, with moulder side to work four sides; iron frame dimension planer to plane 10 feet by 24 inches; iron frame Daniels' planer to plane 10 feet by 24 inches; No. 3 railway cutting-off saw; double-cylinder 26 inch endless bed surfacer; No. 3 six-roll 24 inch sand-papering machine; No. 10 car tenoner and gainer; No. 4 car tenoner; No. 3 medium tenoner; radial horizontal single spindle car borer; regular horizontal single spindle car borer; three-spindle vertical car borer; three spindle horizontal car borer; No. 3 heavy rip saw table; No. 3 double spindle column shaper; No. 4½ 30-inch cabinet surfacer; No. 2 band saw; No. 3 band saw; No. 5 band re-saw, with reversible tables; double revolving rip and cross-cut saw table; 24-inch swing pattern-makers' lathe. Their space is 102 feet long by 40 feet wide. The president of the company, W. H. Doane, who is one of the Commissioners of the Railway Exposition, and who has taken an active interest in promoting its success, is present, giving his personal attention to its progress.

Borland's Injector.

We copy sectional view of a new injector from *Iron*, of London, with the explanation accompanying the cut :

The main features in this injector are that the discharge of the water to the boiler is effected inside instead of outside the casing, which is the usual mode, and that the water is taken in on one side and delivered on the opposite side.

The bottom casing of the injector, which can be readily unscrewed, is thus left perfectly free, and the whole of the inner parts can be removed for examination without disturbing the main pipes or connections. The steam nozzle at the top of the injector is also so constructed that it can be easily unscrewed for examination when required. The arrangement is entirely different from that of the ordinary injector, and secures a simplicity of action and ready access for examination which are a decided advantage. It is claimed by the inventor that the arrangement by which the nozzles and casings are fastened in their places prohibits all possibility of binding through deposits from the water, whilst the proportions of the nozzles insure a prompt and continuous action, proved to be unaffected by the severest jolting. The injectors are made of gun metal throughout. By a special arrangement of the water and steam delivery branches, which are constructed of the same size and screwed with the same thread, so that the parts are interchangeable, the injector can be readily converted from non-lifting to lifting, or *vice versa*, as desired.

Wrought Iron Journals in Cast Iron Boxes—Honesty in Fitting an Important Element—The Pratt & Whitney Co.'s System of Measurement.

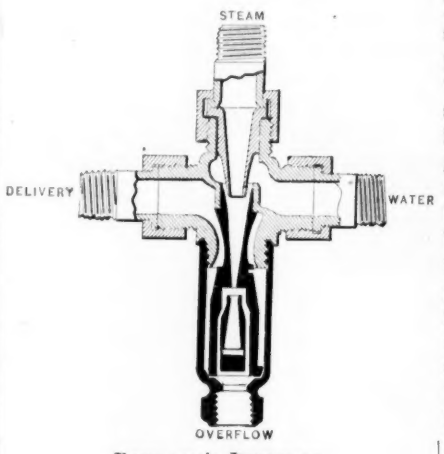
BY S. W. GOODYEAR.

Is it not remarkable that a wrought iron journal of 3″ diameter by 5″ long should have been in constant daily use for twelve years, running in cast iron boxes, 180 revolutions per minute, with no adjustment of boxes to compensate for wear during that time, and still appear to fit as perfectly now as when the machine was first built ? The fact that there was not a sign of rings or the least cutting, while the tool marks were still visible in both journal and boxes, was evidence that the fit was not made by filing and scraping. Such was the condition of a journal and boxes which it was my privilege to examine a few days since, and which I know commenced service in the spring of 1871.

Remarkable in what ? Not that wrought iron makes a good journal or cast iron a good box—most machinists concede that—but that there should have been such honesty all along the line. That the man who bored the boxes should have so honestly followed instructions to bore them with their faces tight together—not with a strip of sheet metal between them to allow for adjustment—and to finish the hole with a sharp tool and light cut, so as to have it round and straight. That the man who turned and fitted the journal, when told that it must be fitted to the boxes so as to run free with the cap screws down tight, should have done just what he was told, when his judgment told him that "it ought to fit a little snug at first and wear to it." That the duty of oiling this bearing should have been so faithfully performed all these years. Not only was there space left for oil in fitting, but it was evident that the oil had never been lacking. And so, this journal, after twelve years' service under the pressure of a 5″ belt running at a speed of 1,700 feet per minute, shows a surface which shines like a mirror. Good as new ? Yes, better—while the machine of which this bearing was a part was still, in nearly every part, in good running order, and as free from bruises as when first put in use.

It is a pleasure to visit a place where machinery is well treated, is it not ? Why are there not more jobs of work done to run for years with scarcely any repairs ? Is it for lack of skill ? No, not half as much as for lack of honesty in doing just the right thing. In the fitting of bearings, if one stops to think, it must be apparent that but one condition is right. If a journal is either too small or too large, in the slightest degree, the friction, instead of being distributed over the entire surface, comes upon the merest line of bearing surface, at each side or at top and bottom. With only one-fiftieth, or even as little as one-hundredth part of the bearing surface which should be had, is it any wonder that, in letting bearings of this kind "wear to it," they are cut and ruined at the very start ?

Nearly as bad is the fit which is so perfect as to allow no space for oil. "A little stiff, but put on plenty of oil and let it run, and it will be all right." Sounds natural, don't it? And so, the oil is poured on in a stream and



BORLAND'S INJECTOR.

the bearing gets hot and grows tighter, until the belt won't drive it. Then it is allowed to stand to cool off a little, the cap screws are loosened up some, and it is run some more. Then it gets stuck, till, on lifting the cap and examining the journal and box, great ugly rings are found. Parts of the journal are found stuck in the surface of the box, and parts of the box stuck in the surface of the journal. Finally, with the aid of cold chisel and files and scrapers and black lead and oil and profanity, the infernal thing is started again, perhaps to go through the same treatment again and again, but, at all events, to be a mean, worn-out bearing from the very start.

Honestly fitted bearings, honestly oiled, will last for years. It is not the metal composing either the journal or the box which should take the wear, but the oil.

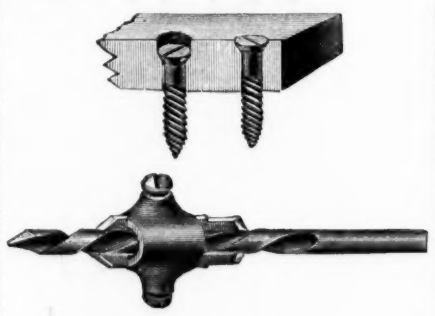
I had the pleasure, a few days since, of visiting the gauge room of the Pratt & Whitney Co. Let any doubter as to the correctness of their methods of measurement, or the accuracy of their mechanical operations, look at samples of their work, and be convinced. They have solved the problem, What is an inch ? and are demonstrating daily their ability to divide or multiply the measurement with a degree of accuracy which is surprising, and which undoubtedly makes it thoroughly practicable to furnish gauges for plain work or for screws, by the use of which work may be made interchangeable. They have entirely mastered the difficulty encountered in the change of pitch in a screw occasioned by hardening, and can furnish hardened thread gauges as accurate in measurement as are the plain cylindrical gauges.

What is close measurement ? Within 1-64″, says one man ; says another, within 1-100″ ; and still another says, 1-128″. Leaving these knights of the box-wood rule and steel scale, we come to those who, with Vernier caliper or micrometer, measure 1-1000″, as near as they can see when two lines agree, and guess as near as they can at imaginary divisions of the 1-1000″. But in the shop named they divide the 1-1000″ into sixty parts with unerring accuracy, and talk about measuring the 1-1,000,000″ as not impossible.

Many of the progressive builders of machinery are already recognizing the great advantage to be derived from a maintenance of standard sizes, not only in plain cylindrical articles, but in bolts and nuts, taps and dies, and, in fact, in all measurements expressed in inches or feet, or fractions thereof. Once adopted, a general system of standard sizes will prove of incalculable benefit to all concerned. In a majority of shops, time enough is spent every year in argument over imaginary sizes, without the means to prove their truth or falsity, on either hand, to furnish an entire set of gauges and measuring machine for reference.

Economy invites. Think of the satisfaction of knowing that one has unquestionable means of proving that what he says of any given size is strictly true. In arguments about sizes, the questions are coming : How do you know ? With what do you measure ?

We were lately pleased to receive a call from one of our old correspondents, A. Dolbear, foreman of the Pennsylvania & Erie Railroad machine and erecting shops at Renovo, Pa. During the last year these shops have changed from the time system of paying machinists to the contract system, which they find more satisfactory. This system has been applied even to jobs of making repairs. Every man to whom a job is given out makes out a plain statement of its character, and hands the same to the gang boss when the job is completed. If there has been no price set for any particular job that may be done, Mr. Dolbear at once fixes a price, which governs for like jobs in the future. Men working on time receive 22 cents to 24 cents an hour. The machine shops have 175 workmen. Last year they built 13 new locomotives, besides doing a large amount of repair work. They are now furnishing four class I and six class E locomotives. Much stress is laid upon the most improved methods of doing work. Occasionally some men will be sent to the Altoona shops for a few days to study their methods of doing certain machine work, their time being paid by the company. This is an excellent feature, and one worthy of imitation by machine shops owned by private parties. More good machinists are in demand at the Renovo shops.



Adjustable Countersink.

The adjustable countersink shown in one of the accompanying cuts can be applied to brace and machine bits, twist drills, and all tools used for boring in wood where countersinking is required. As will be seen by the second cut, two styles of countersink work can be produced. By reversing the knives the hole can be countersunk to allow the screw to come flush with the wood, or the holes can be countersunk in such a way as to not only sink the screw below the surface of the wood, but to countersink for it at the same time.

The tool has but three parts : two knives and the body for holding them. The bodies are nickel plated. The knives can be adjusted for large or small screws. This tool is manufactured by Champlin & Spencer, 154 Lake street, Chicago, Ill.

At a recent meeting of the Engineers' Club of Philadelphia, Percival Roberts, Jr., exhibited a turning from a cast steel roll. The dimensions of the roll, which was cast from open hearth steel, were about 30″ by 5′ 6″. The turning is 4″ wide by 12″ long, $\frac{1}{32}$″ thick, showing the roll to have been very homogeneous for cast steel.

Steel-rail mills have been booking large orders for rails at the present low price. Most of them now have plenty of contracts to keep running for several months. The *Railway Age* thinks that owing to the cheapness of rails thousands of miles of new road will be built this year.

Making and Venting Cores.

BY THOMAS D. WEST.

The subject of cores is a very important one in its relation to the production of good castings. Some years back it was customary in many shops for the moulders to make their own cores, but at the present time core-making is coming to be a distinct branch, at least as much so as loam, dry sand or green sand work. To excel in core-making is a credit equal to that of excelling in any other branches of the moulder's trade, as the success of the moulder in producing good castings is often largely dependent upon the skill of the core-maker. Take, for example, the casting of a steam cylinder. As a rule there is not much trouble with the outside. The risk is in the cored parts. Cylinder cores, as a rule, with the exception of the center core, may be classed as thin and crooked, and are much more difficult to make than larger cores.

The question is often asked how thin is it practicable to make and use cores? To answer this it would be necessary to know the general shape of the core and its position in the mould. A much lighter core can be used if set vertically than if it must be set horizontally. When set vertically there is a much better chance for the gas to escape, as it is not so suddenly covered with iron in pouring and there is not so great a lifting strain on a vertically set core.

The greatest difficulty to be overcome in making thin cores is in rodding and venting them, in fact here is where the greatest skill in core-making is required. The chief cause of gases in cores is in the materials of which they are made, and the least gas there is in a core to be got rid of the better, other things being equal.

A large amount of gas results from the use of flour. The gases from strongly-made flour cores, in a small low-roofed shop, often render it untenable. Rosin evolves but little gas, and hence in many cases its use is desirable, particularly as it vents and ignites easily. Rosin is comparatively but little used, one reason being, no doubt, that it requires to be pulverized, and another that it requires more care to use than most material used for the purpose. Rosin cores will not admit of handling when hot, and are not so reliable for heavy castings; also they cannot be so firmly and readily pasted together as flour cores. Sometimes to assist in removing the objections stated flour is used with rosin.

The chief use of rosin for making cores is in the instance of small cores, in which case it saves labor, because such cores need not be blacked, and can be handled more readily when green than flour cores can be. They assist in producing fine castings, and their toughness enables them to be used where flour cores would not stand.

The blacking of a large number of small cores is not only tedious and costly, but it is often almost impossible to leave the corners as sharp and perfect as when they came from the box.

In mixing sand for small cores two things are to be considered: First, fine sand leaves a better surface on the castings; second, the finer the sand the less opportunity for the vent to get off; hence the question is how fine sand can be used, and at the same time provide for proper venting.

In making small rosin cores moulding and bank sands are the best. If the venting will admit, smoother castings may be made by using the moulding sand alone. If it is particularly desirable to save venting, then bank sand is best. Sometimes bank and moulding sand can be mixed to good advantage.

The amount of rosin that should be mixed with the sand is dependent upon the nature of the sand used, and the kind of cores wanted. With ordinary new moulding sand, one part rosin to fifteen parts of sand will make good cores for ordinary work, but if very strong cores are required a larger proportion of rosin may be used, or the sand may be

wet with molasses and water. In any case it should be borne in mind that the weaker the core the freer the gas will escape. In some cases it is advisable to mix a small quantity of flower with the rosin. If too much flour is used, however, it may make it necessary to black the cores. Sometimes it is desirable to have the surface of cores hard and firm, and the interior porous, so that they will bear handling and provide for a smooth surface on the casting, and at the same time permit the gases to escape freely. In making such cores the more open the sand, and the less flour or rosin used the better. To assist in making a firm, hard surface, the cores should be sprinkled with beer or molasses and water.

The quicker after being made a core is put into the oven the better. The air-dried surface of a core is liable to crumble. Another point that may be noted is that the wetter the sand for cores can be worked, the less the flour or rosin required. At the same time if the sand is too wet, small cores will stick to the boxes, and large cores are liable to sag or crack.

In making flour cores where they must be strong and where they cannot be thoroughly vented it is sometimes a good plan to use boiled flour, as a much less quantity will suffice. To use this the flour should be put in a kettle with enough water to make a thin paste. After boiling this is mixed with water and the sand wet with it. If all the water required can be boiled with the flour all the better.

A man who can successfully make the class of cores shown in the engraving may safely call himself a core maker.

Some port cores are comparatively easily made, but as a rule they are amongst the most difficult to make. To properly rod and vent such cores is often a matter that calls for careful consideration and a good knowledge of the laws of cause and effect.

It is not the intention to offer instruction as to how any special port cores should be made, but rather to show different plans that have been and may be practiced under different circumstances. When the drawings of a cylinder come into the pattern shop, the pattern maker should consult with the moulder as to the best way to make the pattern and the core boxes, to the end that it may be safely and expeditiously moulded.

In the engravings are shown three plans for making port core boxes. The first one can often be used in making small cylinders, to the saving of work by the moulder and increasing the probability of good castings. The ports, exhaust and steam-chest cores cannot always be made together, as shown, but very often they can be.

The second plan, in which part of the core is swept up, is very handy for the moulder, as well as simple for the pattern maker. It gives the moulder an opportunity to see what he is doing, and saves him time and abor.

The third plan is one often resorted to where the cores are quite crooked and irregular, but should never be resorted to where the second plan can be employed.

In the engravings are shown four plans for rodding cylinder cores. The lower right-hand cut represents the making of cast-iron rods. This is done by taking half the core box and bedding its face into the sand, which is made solid for the purpose. The box is then withdrawn, and, by using a gate cutter, a frame similar to the welded core iron shown is made. For a cope or covering, paper is used, laying it over the face of the joint. Sand is then packed on the paper, and boards and pig iron placed to hold the sand down when the frame is poured, which is done through the pouring gate, as represented. Irons like this are readily made, and are good for short, thick cores.

On the right is represented wrought iron rods, ready to have cast on them a narrow plate of cast iron. This is for the purpose of holding the rods in their proper position at the print end. Single cross rods are used, when making the cores, for holding the other ends together. For getting off the vents, holes are drilled or cast in the plate, as shown at 1, 2, 3 and 4. At *X*, *X*, are shown two views of a wooden support, cut to the circle required, and having notches for the number of rods required. This is used for holding the rods in proper position while the plate is being cast on them. This kind of rod is good for very large, thick cores.

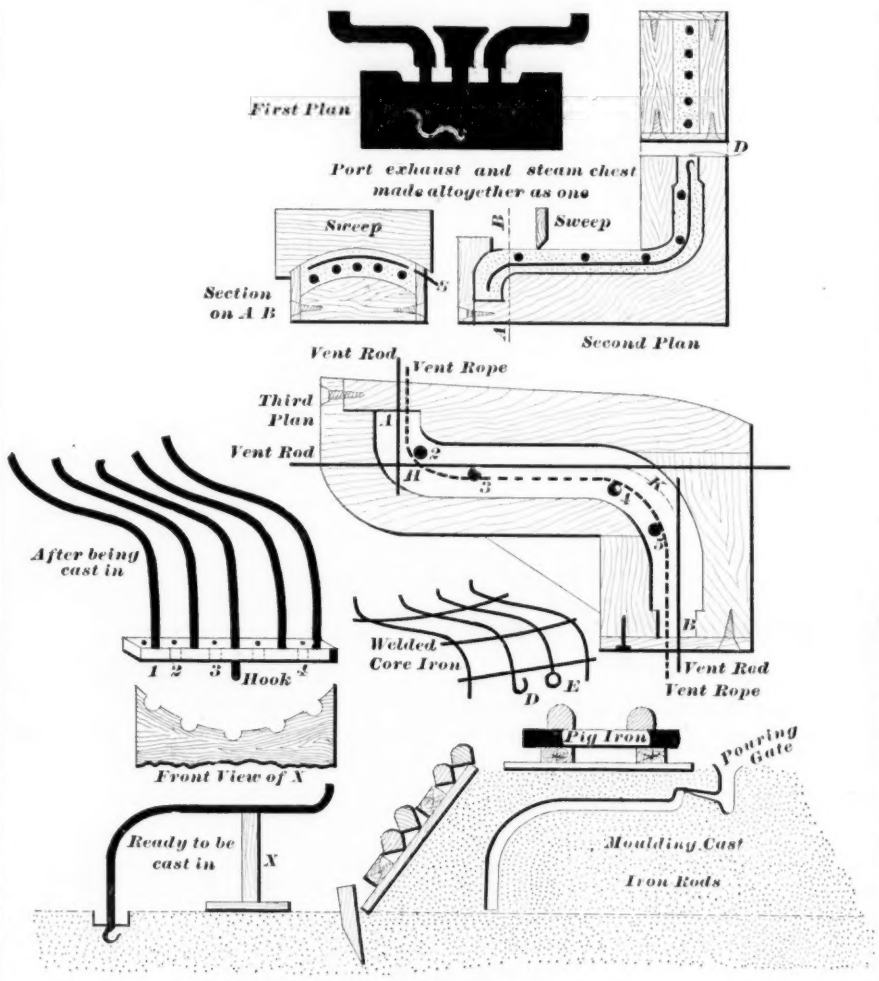
The welded core iron is one commonly used. Sometimes, instead of welding the wrought iron rods, they are riveted together. Frames of this kind make reliable rods for thin cores, large or small. The objections to them are that they are costly to make, and that removing them from the casting is somewhat troublesome.

At *D* and *E* are shown two forms that are used by fastening wire or bolt hooks to them, to securely hold the core in the mould print. The one at *E* is made by simply flattening the end and drilling a hole through it.

The fourth and last plan represents the use of single rods, setting them in the core as it is rammed up. The cut shows the proper manner of placing the rods. Were the long rods laid so as to have the cross rods *S*, on the other side from that represented, when the core was fastened by the hook *D*, in the print, there would be danger of cracking the core. When made as shown, pulling on the hook draws the whole core with it. This plan I have employed for the port cores of large marine engine cylinders. In one shop where the custom was to weld the rods together, I started to make a set of large cores in this way, and was told by the foreman that he had never seen large cores so made, and that he did not think the plan a safe one. As I had made larger ones in the same way, I argued him into permitting a trial. From that time on there were no more welded rods used, and the new plan saved in the neighborhood of five dollars on every cylinder casting.

Regarding the size of rods to be used for such cores, the thickness of the cores and a consideration of getting off the vents, &c., must govern each particular case. The larger the rods the stiffer will be the core, but they should be no larger than is necessary, for it is more difficult to get large rods out of the casting than it is small ones.

If no vents were needed the making of port cores would be much simplified. More, generally, depends upon the vent than upon any other feature. The vent rod and rope shown represent the two plans commonly employed for venting thin, crooked cores. By using the rod a cleaner vent is usually insured than by using the rope. The rope is just as reliable, but requires much more care in its use., which not always being received the liability of failure, is increased. The use of the rods calls for the most work; when rope is used nothing more is required after the core is dry, but with rods there are connections to be made, as at *K*, to make the vent continuous. To connect the vent a crevice should be made with a file, as represented in dotted lines at *K*. This crevice is made deep enough to admit a string to about the center of the thickness of the core. A string is then passed through either of the holes, left by removing the vent rods, and made to enter the other. The crevice is then filled up, the surface smoothed and the string removed. After all the connections have been made the core is put back in the oven to dry the material used for filling the crevice.



MAKING AND VENTING CORES.

At *H*, is shown how rods can sometimes be made to connect themselves within the body of the core, thereby saving the labor just detailed. The holes at the surface of course require filling, and when the rods connect near the surface of the core care must be used that the filling of the holes does not close the connection. After *H* and *K* have been filled, test the vents by blowing smoke or dust through, as from *A* to *B*. If all the vents are clear then stop up the openings.

In using rope or strings the arrangement of the vents is generally made before the cores are removed from the boxes, and care must be used or in pulling them out they will be drawn up to the side of the box. A crooked laid rope or string has a tendency to straighten when pulled, and although the sand may prevent this, there is always a chance that it will not do so. Sometimes to all appearances the operation may have been successfully performed, but in pouring the mould the string may have come so near the surface in some places that the iron will cut through. At 2, 3, 4 and 5 are represented rods placed to prevent the string from being pulled up against the sides of the box.

The making and venting of cores is a broad subject, and calls for the exercise of thought and judgment. As in moulding, he that is not too indolent to think will be the most successful in core making.

LETTERS FROM PRACTICAL MEN.

Weighing Valve Pressure—Grinding Watch-Case Springs.

Editor American Machinist:

Professor Robinson's valuable paper in No. 22 suggested to me that experiment on the weighing of the valve pressure was not exactly equivalent to the conditions under which a valve works in practice. In practice the valve is a plate supported all round its edges and loaded evenly all over, producing a certain flexure.

In the experiment the valve was supported upon a point in the middle and loaded as above, producing a different flexure.

If the valve was turned out in the hollow part to a flat surface, somewhat larger than the circle of the orifice, and a loose plate fitted into it, with its upper edges raised and a central conical sink in the under side for the lifting bar, a truer result might be obtained, and I believe a smaller area to be balanced would be indicated.

The probable reasons why W. S. Harris is troubled by the breaking of his watch-case springs, after grinding them on an emery wheel, are that he does not give them the right shape, and grinds them on too large a wheel. He probably grinds them crosswise, leaving sharp cross scratches, which act like the cut of a diamond on a glass plate. If he will finish his springs on a fine wheel, grinding lengthwise, after giving them an oval cross section, I doubt his experiencing any further trouble from breaking. I have fitted thousands of case springs and never knew one to break.

Philadelphia, Pa. G. B. WOLD.

Lathe Construction—Bolts, Nuts, and other Accessories.

Editor American Machinist:

Your letters from practical men on lathe construction have been read by me with a great deal of interest, and I think have done good, because I notice that some of the new shops in advertising their wares, draw particular attention to the size and length of the front, bearing of the fast headstock spindle, the extra weight and rigidity of the bed and heads, and the powerful spindle gearing; also to the length and ample surface bearing of the carriage slide rest, &c. From the tone of the average letters, the advocates of lathes constructed on the massive, durable, powerful, and expensive Whitworth type, are in the minority.

Chordal's remarks on public dogs, public bolts, &c., and the miserable, unsystematic, disorderly, slip-shod, slovenly manner in which some shops are conducted, are perfectly true. Some men seem to think a bolt or nut never requires oil. I have found a good plan for lathe bolts for chucking, is to have shelves put up on the wall in an accessible place with the length painted on the partitions, varying an inch from 4″ upwards, with four bolts in each partition. Such an arrangement costs little, and is a great saving in time. Dogs ought to have special pegs to be hung on when not in use, and mandrels should be shelved in the same way, with the diameter marked. All lathes should be furnished with properly-made double-ended wrenches, and few are required where the nuts and set screw-heads are standard sizes. A monkey wrench is an abomination about a lathe.

Speaking of dogs, in my opinion the one with straight round ends and no cranked tail is the best. The boss or hub where the screw goes through ought to be of a length so that if you want to drive double, the studs on the face-plate will touch both ends. The weight of both ends should be alike, so as to balance perfectly. The screws ought to be large, the dogs above 4″ should have 1″or 1⅛″ steel screws, with a square head, no larger than the thread, and a good, round, turned, double-ended, case-hardened box wrench to screw up with.

A dog driven from a cranked or crooked tail in a slot in the face-plate is not steady. Bodmer and Whitworth made all their dogs

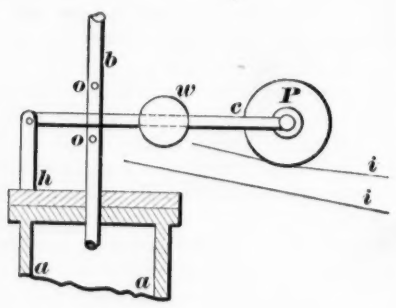
with straight tails. I had a set of dogs up to six inches made that way a quarter of a century ago, and the large ones are all in excellent order yet.

I have found a good way to drive a piston when turning the spider is to have a wrought iron sleeve or base bored taper to fit the crosshead end of rod, turned parallel on the outside, with a slot planed through the entire length; then put a special round-ended dog on the outside of the bush, with the binding screw on the side. There may also be a pin through both bush and slot of the piston rod. When driven in this way there will be no jarring or slipping.

Double drivers on the face-plate are much better than single for most jobs.

Such things as bolts and dogs may seem of small importance, but a shop where each machine is well furnished with properly-made clamps, blocks, bolts, wrenches, &c., has an immense advantage over an ill-conducted one. A great deal in this respect depends on the foreman. If he is a practical tool man, he will have tools, and have them and everything belonging to them kept in perfect order.

Speaking of the butts and straps of connecting rods, there is no part of a locomotive that ought to be better fitted. The practice here is to put a slight taper on the butt and strap, on the side, plane the brasses in the shaper as near as practicable, and then scrape and file them until they fit perfectly all over both bottom and sides, and drive down with a block of wood and heavy hammer. The keys ought also to fit perfectly in the slots, and be perfectly water tight, as the rain penetrates and rusts them. I have seen rods where the brasses have plenty of bearing surface on the straps, fitted up in this way, and show very little wear at the end of four years; in fact, be in much better order than some of the new ones from the contract shops, where they are tumbled together off the machine, and fit nowhere. J. K. C.



Stop Motion for Governor.

Editor American Machinist:

The accompanying engraving represents a stop-motion which may be applied with very little trouble to any steam-engine governor.

The shell of the valve is shown at *a*, *a*, and the valve rod at *b*. A lever *c* is pivoted at one end to the upright *h*, while the other end is supported by the pulley *P* resting upon the belt, *i*, *i*, which drives the governor. Should the belt break or run off the pulley the lever *c* falls, being assisted by the adjustable weight *w*, and coming in contact with one of the pins, *o*,*o*, presses down the valve rod *b*, closing the valve and stopping the engine. The pins, *o*, *o*, should be sufficiently far apart to permit a free action of the valve without interference with the lever *c*.

Herbert D. Penney.

New Gloucester, Me.

Diagrams that were Not Doctored.

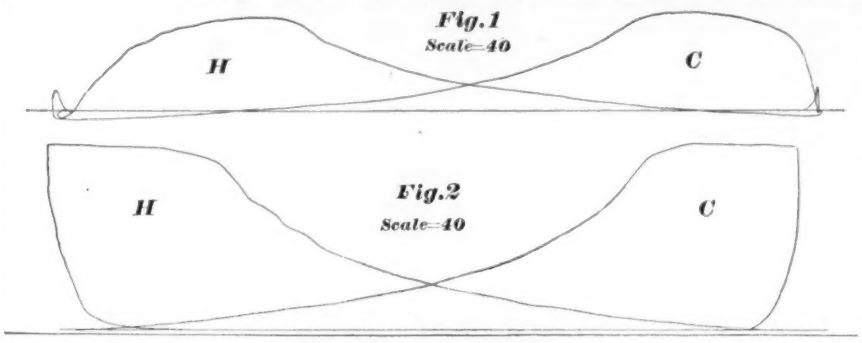
Editor American Machinist:

The engravings Nos. 1 and 2 are indicator diagrams, taken from an automatic cut-off steam engine.

No. 1 shows how the engine was left by the mechanic who set it up about eighteen months ago. No. 2 shows how we left it. The data found on the back of cards were as follows: Cylinder, 13″x34″; spring, 40; revolutions per minute, 75; clearance, 3 per cent. Diagram No. 1 was taken with engine driving shafting alone, with a boiler pressure of 45 pounds. Diagram No. 2 was taken with regular load as in driving shop, with a boiler pressure of 47 pounds.

There were no experts present; simply a couple of engineers. The cards are respectfully submitted for the consideration of the Keystone Council, of Philadelphia.

Mount Joy, Pa. J. C. D.



Diagrams Not Doctored.

Principles of Screw Cutting on a Lathe.

Editor American Machinist:

The correspondent who signs himself "Machinist" is right in criticising Chordal's low estimate of the number of lathesmen who know how to calculate gears for screw-cutting. I notice, however, that "Machinist" says nothing about the "one man in twenty who understands the subject thoroughly." The fact is, too many of us are content to know *how* to do a thing without troubling ourselves about the *why*. Had Chordal said that only one lathesman in twenty understands the principle of screw-cutting, he would have been near the truth. One of the few who do know, would do an inestimable service to the army of mechanics who do not know, by imparting to them the why and wherefore of the arrangement of gears for screw-cutting. G. T. E.

Buffalo, N. Y.

[What Chordal said was: "Stand twenty lathesmen in a row; start catechising them, and you will only find two who understand the principles of a screw-cutting lathe. Any of the twenty can put gears on a lathe and cut screws, if there is a brass plate around somewhere, telling them what gears to put on. But only one out of ten can figure out the right gears in the absence of the table." The philosophy of the thing was well explained by Frank H. Richards, in the American Machinist of August 13th, August 20th, and October 15th, 1881, under the title of "Screw Cutting on the Engine Lathe." Copies of those issues can be obtained through newsdealers.]

Peculiar Valve Construction.

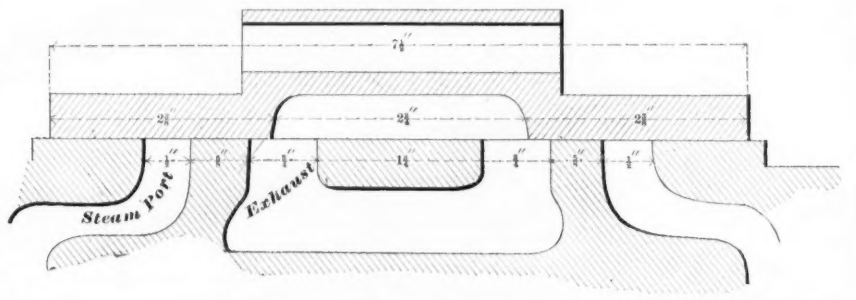
Editor American Machinist:

I send the enclosed sketch of a valve and valve seat taken from an engine, evidently designed by some one who believes in "compression."

It would be quite an interesting problem to work out the effective power of this engine, between its excessive lap on steam side and excessive compression of exhaust. The engine was 5½″ bore by 8″ stroke; travel of valve, 5″.

It will be seen by this that with a ½″ port and 3″ valve travel there is 1″ lap on steam side and ⅞″ lap on exhaust side. Would like you to let our young engineers know what is sometimes done in the line of lap, compression, expansion, &c.

Erie, Pa. C. C. Collins.



Peculiar Valve Construction.

Sewing Belts.

Editor American Machinist:

I herewith send you a rude pencil sketch of my manner of sewing belts. I am aware that to introduce any style differing from the old and established mode of lacing is like throwing a fire brand into camp, and I expect nothing else than that the class of mill men who have followed in the footsteps of their fathers and grandfathers for ten generations will come down and squelch me in double quick time.

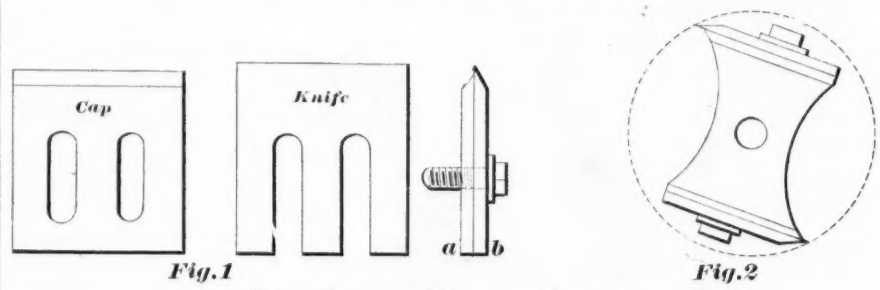
Nevertheless, I venture to state that the practice of lacing belts with the string running parallel with the belt on the side next to the pulley is wrong. When the lacing runs double, as it must do when running straight, it carries the belt off from the pulley for some distance each side of the joint, causing a thumping, when running over a small pulley, not unlike a small trip hammer. This causes the belt to jump, which with the amount of clearance from the pulley face causes the belt to slip, unless it is unnecessarily tight, which brings extra strain upon it and a useless load upon the machinery.

A in the sketch shows a lacing crossed alike on both sides. I commence at *f*, pulling one end of the string through *g*, the other through *h*, then alternately from *h* to *j*, and *g* to *i*, and on across the belt to *o* and *m*. This leaves the ends of the string sticking upward. Then take *o* and put it through *m*, and round through *o* again. Then put *o* through *k*, and *m* through *i*, and on back to *g* and *h*; next put *g* through *h*, when the joint will be complete and alike on both sides, with the string sticking each way through *h*. Then placing each end through *h* and *g*, the ends will be sewed. Now, take your awl and force the laps of the lacing apart, *i.e*, the upper one off from the one lying on the belt as far as possible, and with a light hammer pound down the joints. (The string should be damp.)

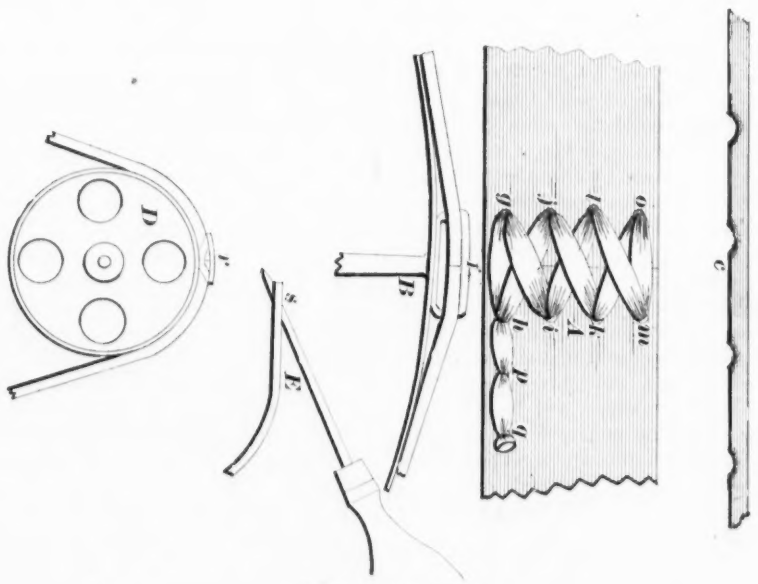
You will find that you do not have anything near the amount of thickness at the ends where they pass through the belt as when the string runs double and straight. You will also find the joint much more elastic, and require very little pounding, unless the pulley is very small. In use, the string does not wear away as when double, but wears as shown at *c*, where it overlaps the lower one, while its other edge remains intact and will last nearly twice as long at the same labor as when put on double and straight.

Belts for very small pulleys should be sewn as shown at *D*, where *r* shows the lap. The manner of placing the awl through the leather is seen at *E* and *S*. When put together in this manner with a light string, and well hammered down, it will run without noise. *B* shows a portion of a pulley rim with a belt laced in the ordinary way with straight double belt string on the pulley side. Leather belts should be always placed with the smooth side to the pulley; so also should the lacing be. P. H. Wait.

Sandy Hill, New York.



Knife Caps for Moulding Machines.



Sewing Belts.

Knife Caps for Moulding Machine Cutters.

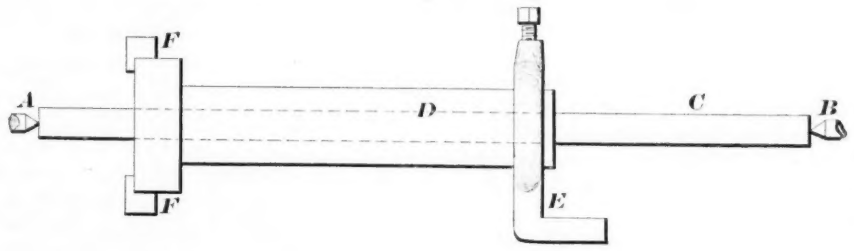
Editor American Machinist:

Having become a constant reader of your valuable journal, and becoming much interested in reading "Shop Kinks," after much hesitation, and some misgivings as to how a new departure would be received, I at last made up my mind to relieve myself of the suspense by giving you one of my "kinks" relating to a softer material than, perhaps, most of your readers work in, which should you see fit to publish, may benefit some one in reach of your paper, and be the means of developing some hidden "kinks" from others engaged in working like material with myself.

My "kink" consists of capping the four heads of a four-sided moulding machine, doing square work, at feed speed of 16′ to 18′

per minute on such woods as beech, birch, hickory, maple, ash, &c., (which will necessarily be against the grain on two of its sides) without tearing or mutilating to any extent. Have made from steel (I used an old saw plate) caps, same shape as knives of 10, 11, or 12 saw gauge. Make elongated bolts hole (not slots) as per diagram, Fig. 1. Grind one edge to dull cutting degree at angle of bevel on knife. Hammer on opposite side of bevel to make crowning, so when bolted on to head the edges will hug closely the knife, as shown at *a*, *b*. The hammering gives spring to the caps, causing close adherence to knife at cutting edge, which should project beyond cap about $\frac{1}{16}''$, and both project beyond edge no more than will give clearance to bolt-heads, say $\frac{3}{32}''$ to $\frac{1}{2}''$, barring, of course, the projection of knife over cap. Position of heads when adjusted are shown in Fig. 2. If the caps are fitted and ground and tempered properly, there will no chips force themselves between them and the knife. I have had them in successful operation for the past six months, and find them far more satisfactory than any other method I have tried. In about twenty years' experience in different cities of the United States I have never run on this "kink" before, or ever heard of it.

WOOD-WORKER.



Another Boring Bar.

Editor American Machinist:

I send you a sketch of a boring bar which I have found simple and very useful in several instances. In the accompanying sketch one end of the work is secured in the chuck with the other end running in the steady rest.

The turned bar *C*, mounted on the centers, *A*, *B*, serves as a guide for the cutter head *D*, and its long sleeve, the hind end of the sleeve being secured to the tool-post by means of the dog *E*, so as to effect a feed. By setting the tail-stock over, as in taper turning, a hole of any desired taper may be bored.

The main feature of this bar is that the work revolving may be trued by outside or other parts, whereas if it was bolted to the carriage it would be not only laborious, but uncertain to true by these parts. Any degree of taper that can be turned may be bored by using this bar. One or two cutters, *F*, *F*, may be used.

Cincinnati, O. M. C. R.

The Balanced Slide Valve Question.

Editor American Machinist:

I would like to say that, even admitting that Mr. McGregor's theory is correct, as expressed by him in your June 2d issue, and that the downward pressure on a slide valve comes only where there are "openings (or ports) under it," or, in his words, "if there are no ports or openings, there would be no pressure," then how about the large opening (or pocket) under the center of his valve? Does it not take *exactly* the same amount of upward pressure, acting in this pocket, to balance the downward pressure on the plate over it? Or has he (Mr. McG.) a special kind of steam, which selects only certain openings over which to exert its downward pressure?

If he has, then he possesses a good thing (the educated steam, not the valve); but I think it would be better if he would educate his steam not to press downward over the steam ports, in the same manner as he has it acting over his balance pockets; then he could make his valve any shape he wanted to, and as his steam would not press on the valve where it covers ports (or openings), and as there is "no other pressure on it," he could then do away with his balance pockets and still have a perfectly balanced valve.

As to his (unnamed) authority, which is "worth one thousand times all offered as yet," I would prefer to take the word of such authors as Rigg, D. K. Clark, Trautwine, Nystrom, etc., who are not afraid to put the results of actual experiments on paper. Moreover, their names always appears, to show the authority. BERT. BALDWIN.

Cincinnati, O.

Riveted Joints.

BY E. E. MACGOVERN.

The strength of a riveted joint may be considered as dependent upon the several conditions of its making. These may be taken as,

First, the relative effect of punching and drilling upon the strength of the plate;

Second, the effect of adhesion between the plates;

Third, the strength of the rivets;

Fourth, the proportion of the joint.

The question of the relative effect of punching and drilling is of uncertain age. There is no doubt, however, that both sides of the question have their respective advantages and defects. Experiment has shown that, in addition to the evident loss by reducing the section in a riveted joint, there is also a loss per unit of actual section, whether the hole be punched or drilled. When punched, we can readily believe that the requisite force will necessarily strain the metal in the immediate vicinity of the hole, particularly when the material possesses a high elastic limit, and where the holes are near together or near the edge of the plate. These evident defects of punching are shown by experiment to be modified by increasing the thickness of the plate, and by making the die six-fifths the diameter of the punch. Further modifications are felt when the pitch is increased, and also when the distance of the rivet hole from the edge of the plate is made greater. In treble and in quadruple riveting, where the line of weakest section is generally through the line of rivet holes furthest from the edge, it is probable that there would be no difference in strength between punched and drilled riveting in these cases. A consideration of these facts has led the writer to the conclusion, in the absence of any decided proof to the contrary, that, in double and multiple riveting, the strength of the construction is independent of the manner in which the plate is pierced, provided the dies and punch be made as indicated above, and that the same amount of care is exercised in each case.

The effect of adhesion between the riveted plates is a matter of no small consequence, and yet the writer is not aware of ever having seen it treated in the more common textbooks on boiler construction, etc. It seems reasonable enough that, in any riveted joint, and particularly where the work is done by a riveting machine, that there should be considerable adhesion between the plates, and that this adhesion should perceptibly increase the strength of the structure. This seeming self-evident proposition has been rejected by many well-known engineers. Fairbairn himself remarks: "It might be that the pressure or adhesion of the two surfaces would add to the strength; but this is not found to be the case to any great extent, as, in almost every instance, the experiments indicate the resistance to be in the ratio of the sectional areas, or nearly so." Reed,* having investigated the subject at a considerable length, gives the result of several experiments, from which it appears that, in double-butt strapped joints and rivet-pitch four diameters, the resistance to this adhesion alone amounts to four and one-half tons per rivet for three-quarter-inch rivets, and to five and one-half tons for one-inch rivets. It is to be regretted, however, that it is not stated whether these results were from experiments on machine or hand riveting.

Reed further argues that the rivet, being continually in a state of tension, has its actual shearing strength reduced; and hence, if we take the shearing strength of the rivet as equal to the shearing strength of the bar-iron from which it was made, this will include an allowance for the adhesive force, and "it would, consequently, be improper to arrange the fastenings of a wrought-iron structure on the assumption that the shearing strength of the rivets (determined by experiments on rivet bars) and the friction of the surfaces might be treated as acting conjointly and independently."

An exception to Fairbairn's positive rejection of this augmented-strength-by-adhesion theory might be taken on account of the conditions of the experiments from which he adduces his rejection. Fairbairn's experiments were made principally upon lap joints, and hence the adhesive resistance would not augment either the ultimate strength of the joint or the ultimate shearing strength of the rivet.

This will at once be apparent when we consider that, owing to the cross-bending of the plates, the lap seams were in every case so much opened out before breaking that there could have been no friction of any account between the surfaces.

Further, in Fairbairn's experiments with double-butt strapped joints the rivet area was in no case less than fifty per cent. in excess of that of the plate; and, therefore, as this adhesive force adds almost entirely to the strength of the rivet, and augments the strength of the plate little or nothing, it is evident that, before making such a sweeping rejection of the theory, Fairbairn should have experimented upon double-butt strapped joints, whose net plate section was less than the section of the rivets exposed to shearing strain.

The writer, therefore, concludes that, in double-butt strapped, in multiple riveted, and in single-riveted joints (when not exposed to bending action), the adhesion between the plates does perceptibly increase the strength of the structure.

Where holes are drilled, it has been found by experiment that the shearing strength of the rivet is considerably less than the tensile strength of the plate, if of the same quality.

This, considered with the fact that of two rivets of the same quality, make, and similar in all respects, the one in the drilled plate has a smaller shearing strength than the one in the punched plate, will conclude the subject of "the strength of rivets."

Our fourth and last heading is the consideration of the proportions of riveted joints, and from what has already been said under the other heads, we may conclude:

First, for punched holes, that if punching actually reduces the tensile strength of the plate, we should design the section of the plate greater than the shearing section of the rivets.

Second, if adhesion does materially increase the section of the rivets, we must increase the section of the plate to such an extent as to make both components of resistance equal.

With drilled holes we conclude:

First, if the cutting action of the hole-edge is so great as to make the shearing strength of the rivet less than the tensile strength of the plate, we should increase our rivet area. By blunting this cutting edge, however, we would probably be safe to assume, for drilled holes, the sectional area of plate equal to the shearing section of rivets. Our rule for riveting, then, would become: Multiply the area of the cross-section of rivet by the number of sections of rivet to be sheared per pitch, divide by the thickness of the plate in inches, and the diameter of the rivet in inches to the quotient. The sum will be the pitch for riveting. The number of sections of rivets to be sheared per pitch becomes:

For single riveting, 1.
" double " 2.
" treble " 3.
" quadruple riveting or for double butt-strapped riveting, 4.

From this rule the following table has been calculated:

TABLE GIVING PITCH OF RIVETING WHERE PLATE SECTION EQUALS RIVET SECTION.

Thickness of Plate. Inches.	Diameter of Rivets in Inches.	Single Riveting Pitch in Inches.	Double Riveting Pitch in Inches.	Treble Riveting Pitch in Inches.	Quadruple Riveting Pitch in Inches.
3/8	5/8	1 7/16	2 3/16	3 1/16	4 1/16
7/16	11/16	1 1/2	2 1/4	3 3/16	4 3/16
1/2	3/4	1 9/16	2 5/16	3 5/16	4 5/16
9/16	13/16	1 5/8	2 3/8	3 7/16	4 7/16
5/8	7/8	1 11/16	2 7/16	3 9/16	4 9/16
11/16	15/16	1 3/4	2 1/2	3 11/16	4 11/16
3/4	1	1 13/16	2 9/16	3 13/16	4 13/16
13/16	1 1/16	1 7/8	2 5/8	3 15/16	4 15/16
7/8	1 1/8	1 15/16	2 11/16	4 1/16	5 1/16
15/16	1 3/16	2	2 3/4	4 1/8	5 1/8
1	1 1/4	2 1/16	2 13/16	4 3/16	5 3/16
1 1/16	1 5/16	2 1/8	2 7/8	4 5/16	5 5/16
1 1/8	1 3/8	2 3/16	2 15/16	4 7/16	5 7/16
1 3/16	1 7/16	2 1/4	3	4 1/2	6
1 1/4	1 1/2	2 5/16	3 1/16	4 5/8	6 1/8
1 5/16	1 9/16	2 3/8	3 1/8	4 11/16	6 1/4
1 3/8	1 5/8	2 7/16	3 3/16	4 13/16	6 7/16
1 7/16	1 11/16	2 1/2	3 5/16	4 15/16	6 5/8
1 1/2	1 3/4	2 9/16	3 3/8	5 1/16	6 3/4
1 9/16	1 13/16	2 5/8	3 7/16	5 3/16	6 7/8
1 5/8	1 7/8	2 11/16	3 1/2	5 5/16	7
1 11/16	1 15/16	2 3/4	3 9/16	5 7/16	7 1/8
1 3/4	2	2 13/16	3 5/8	5 1/2	7 1/4
1 13/16	2 1/16	2 7/8	3 11/16	5 9/16	7 3/8
1 7/8	2 1/8	2 15/16	3 3/4	5 5/8	7 1/2
1 15/16	2 3/16	3	3 13/16	5 11/16	7 5/8
2	2 1/4	3 1/16	3 7/8	5 13/16	7 3/4
2 1/16	2 5/16	3 1/8	3 15/16	5 15/16	7 7/8
2 1/8	2 3/8	3 3/16	4	6	8

A panic in a great crowd on the promenade part of the Brooklyn Bridge on Decoration Day, caused the death of several people, and the injury of many more. The premature opening of a part of the bridge after the imposing ceremonies of May 24th, which for reasons now widely known was selected as "a fitting time" to celebrate the opening, is conceded to have been a great blunder. The New York *Times* justly says:

"The truth is that the passengers across the bridge who, according to its plan, are to occupy three of its roadways, have since the premature opening been crowded upon one. It must now be plain to the managers of the bridge that it was a tragical blunder to open the bridge at all to public traffic until all parts of it could be opened, and each roadway do something like the proportional share of the business which had been assigned to it in the plans. Even if the railway had been in readiness for the opening, as it should have been, the novelty would during the first days have unduly crowded the footway with passengers, and it would have required extraordinary precautions to avert accidents."

The railroad is expected to be opened about July 4th, after which the real public advantages of the bridge will be apparent.

* Shipbuilding in Iron and Steel.—E. J. Reed.

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NEW YORK, JUNE 16, 1883.

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Considerations in Supplying a Foreign Demand.

But a small proportion of our machinery and tool manufacturers have given any continuous attention to orders for export. When business has been dull quite a number of them have sought and secured some orders for export, but as soon as home orders revived the export business has, as a general rule, been neglected. Thus export orders have been widely regarded as a mere convenience to dispose of surplus stock that would otherwise remain on hand too long. With a few houses the export demand has been treated as being of a permanent character, but with a much larger number it has been looked upon as temporary. Some of the results of the latter policy have not been especially favorable to an enlarging demand for American wares in foreign countries. Inferior articles have been packed up and sent abroad, ostensibly as goods of regular quality made for home trade. Wherever they have gone American goods have been condemned so heartily that it has been difficult for any of our manufacturers exporting goods of really excellent quality to obtain a single order. On the other hand, where American wares of standard home grade have won a reputation in some foreign market, imitators have sometimes entered the field with inferior goods, and damaged this reputation to an alarming extent. The fact that some of these imitators have been foreigners, who have thereby sought to overthrow the prestige of American goods, does not in any degree excuse those of our own countrymen who resort to such practices.

There are different grades of laxity in carrying on a foreign trade; in a greater or lesser degree, the complaint seems to affect most of the houses filling foreign orders. In a report of the Board of Commissioners of the Melbourne Exposition, after the mention that much benefit has already been derived from the representation of American wares at that world's fair, we find the following:

"Agencies were established for many productions, and a good trade may be maintained if our manufacturers and producers will consider the importance of promptness in filling orders for export.

"The manufacturers of Great Britain and the Continent are too anxious to secure the trade of Australia for our manufacturers to make a convenience of export orders, as has heretofore been done by several, and of which many Australian merchants justly complain."

If, in view of this state of affairs, British manufacturers capture and hold the markets, not only in Australia, but in other countries, it is not only futile, but unjust, to charge it to prejudice against American goods. According to present indications, our manufacturers of machinery and tools will be enabled to supply quite a large foreign demand within the next five years. It is very essential that they study the favorable and unfavorable elements likely to operate in dealing with foreign customers.

A Word About Names.

The other day in looking over the list of names of its subscribers published by a new journal (*Science*) we were interested in observing the occupations and explanatory addresses appended to some of the names figuring in the list.

One Boston subscriber is mentioned as an "Author and Capitalist." Whether he is a capitalist, as a result of his labors as an author or only in spite of them, as is apt to be the case, does not appear. If our new contemporary can unfold any scientific plan for more generally combining these two avocations in one, the telephone will not have been invented or *Science* founded in vain.

Further on in the list appears a name styled "Lawyer and Capitalist," which seems to be a more natural combination. Another subscriber is mentioned as "Financier Hotel Vendome," whatever this may mean in an American city. Three Harvard students are described as "Candidates for A. M.," "S. D." and "Ph. D." respectively, which suggests the thought that if all the candidates for political preferment in this country were to follow the candid example set by these young men, who know what they want and are not ashamed to say so, what an ambitious population ours would appear to be!

By the way, what is the exciting cause which induces so many aspiring young collegians to write out in full on all occasions all the tenderly various names which were hitched on them in infancy by proud parents and relatives? Apparently these hopeful youths think that Shakespeare was considerably out of his reckoning when he averred in effect that a rose by fewer names would smell as sweet.

Perhaps it would be in order to suggest that in every-day matters, for a very young man, who has never accomplished anything of special moment to the world, initials would be good enough to start on. As years pass and the breezes of achievement and prosperity begin to blow upon him, a reef in the shape of an additional cognomen might be let out from time to time until finally breadth of fame, length of days and length of name become in his case appropriately conjoined. As opposed to this suggestion, however, it may be noted that usually the most successful men have in the main been those who either had few names or kept what they had in good subjection.

William Watts.

We regret being called upon to announce to our readers the death, after a brief illness, of the well-known engineer and machinist, William Watts, head of the engineering firm of Watts, Campbell & Co., Newark, N. J.

Mr. Watts was born in New York City in August, 1825, and died at his residence in Newark on the evening of May 27. When he was about seven years of age, his parents moved to Newark, where he continued to reside until the time of his death.

Young Watts early showed an inclination for mechanical pursuits, which led to his being apprenticed to Seth Boyden to learn the trade of a machinist. After concluding his apprenticeship with credit to himself, he worked at his trade for a time for the then new firm of Hewes & Phillips, Mr Phillips having been his shopmate during his apprenticeship. His mechanical ability was, however, too pronounced, and his inclination to engage in business in a capacity that should afford opportunities to utilize and develop his engineering talents too strong, for him long to remain in a subordinate position. Hence in a short time he established a partnership under the style of Watts & Belcher, the firm opening a shop for doing a small general machine business. Their business increasing, and their location being unsatisfactory, they built a small shop at the corner of Ogden and Passaic streets, to which they removed their tools, supplementing them with such others as they had means to procure, Mr. Watts' ambition being the eventual establishment of a first-class machine business.

In 1856, Mr. Belcher dying, Mr. Watts associated his brother with him in the business, and in 1865 Daniel T. Campbell was admitted to partnership, he having been in the employment of the firm during the eight previous years. The title of the newly organized firm was Watts, Campbell & Co, which it has retained, with Mr. Watts at its head, to the time of his death. From the time of its organization to the present, the business of the firm has steadily increased, new buildings having been added almost yearly, Mr. Watts having the satisfaction of seeing the little enterprise to which he had devoted himself grow to its present proportions, and the firm name, known only to its immediate neighbors, become generally known throughout the country, and quite extensively abroad.

In their earlier days the firm manufactured a general line of machinery, particularly sugar machinery, which found its way to Cuba and to other sugar-making districts. Mr. Watts, however, being interested in steam engineering, eventually the firm turned their attention more specifically in that direction, until at the time of his death he was especially known in connection with the Watts-Campbell Corliss engine, to which he gave the greater part of his attention, and to him several improvements in its construction are due.

Although Mr. Watts started in his mechanical career under the disadvantages of a limited education, he early appreciated these disadvantages, and labored hard and successfully to overcome them. Naturally of a somewhat retiring disposition, the extent of his ability as a mechanic and an engineer was not likely to be comprehended, except by those who had (as the writer has) enjoyed the privilege of frequent conversations with him on mechanical and engineering topics. To such, the breadth of his views and the correctness of his judgment were apparent. Although frequently solicited to allow his name to be used in connection with city offices, he always refused, being, in every sense of the word, wedded to his chosen pursuit. The large number of personal friends made by him, and the universal esteem in which he was held, not only by his associates in business, but by the community in which he spent his life and achieved his success, sufficiently attest to his qualities as a man.

The immediate cause of his death was paralysis, and although sick but about two weeks, and confined to his house but one week, his associates had for some time noticed in him symptoms that caused uneasiness in his behalf.

Mr. Watts leaves no family, having never been married.

The National Railway Exposition at Chicago is attracting large crowds every day. Many people will regret that it is to last only one month. In our next issue we expect to publish some general notes of the exposition, written by Angus Sinclair. On another page of this issue will be found a list of the machines shown in three or four of the largest single displays.

Malleable Iron Works.

Malleable iron castings are merely iron castings treated by an annealing process to make them malleable. Less than five years ago one could count upon his fingers all the establishments in this country making malleable iron castings. Now they have multiplied, not only in number, but in capacity, far beyond the ratio of the increase of general iron manufactures. Perhaps the reason is, these castings have been improved about a hundred per cent. in quality, and at the same time made lower in price. Still, the demand seems to be a little ahead of the supply.

The large malleable iron works at Springfield, O., are doubling their capacity for production; immense new works are now erected at Bridgeport, Conn.; and the malleable iron works at St. Louis are enlarging so as to equal or exceed the capacity of any other establishment of the kind in this country. Other malleable iron works are building or enlarging, both in the East and the West. The uses of malleable iron castings are becoming better appreciated every day.

An Owosso, Mich., correspondent, Charles A. Byerley, writes us that he hears with pleasure of the progress of the National Association of Stationary Engineers, and gives some notes of a meeting recently called in that place to organize a branch Engineers' Society. The meeting was a success, and the society is organized at Owosso. Our correspondent adds:

"The twist-drill question has been ably discussed in a recent issue. There was a time, not long since, when I should not like to have had Mr. Richards look over my toolboard, but I have driven some of his suggestions into my head, until now I can say, 'Come along, Mr. Richards, and see what you have done for me on the side tool shaping matter.' Let us have more on lathe tools."

The National Association of Stationary Engineers has lately chartered new societies, as follows: Louisville, Ky.; Owosso, Mich; New Haven, Conn.

Williams & Kemp, Baltimore, Md., write us:

"We noticed in the AMERICAN MACHINIST of last week, in Questions and Answers, an inquiry from "W. S., Baltimore, Md.," in which he asks certain information in regard to his engine. We would like to say, that if he will call on us, we can possibly do for him what he requires. We did not think our engine was doing duty for the amount of coal burned, and so we took off the valve and eccentric and put on others properly proportioned, also a new steam-chest face. The result is that we save about one-seventh of the coal, and the engine runs better and more uniform. If 'W. S.' will call at our shop he can see this for himself."

At a recent meeting of the Rhode Island Engineers' Association, of Providence, Harry D. Cozens, the first president of the association, was unanimously sentenced by the members present to receive at their hands an elegant gold watch and a leather traveling bag. Mr. Cozens submitted to the infliction with good grace. The verdict of his friends seems to be, "Served him right."

Literary Notes.

ANNUAL REPORT OF THE SECRETARY of the Internal Affairs of the Commonwealth of Pennsylvania. Part 3, Industrial Statistics, Vol. 10, 1881-2.

We have just received, through the courtesy of Joel B. McCamant, Chief of the Bureau of Statistics, a copy of the above-named report. In the first part of the book is an elaborate history, by James M. Swank, Secretary of the American Iron and Steel Association, of the iron and steel industries of the world, more especially those of Pennsylvania. In his report Mr. Swank explains the primitive discoveries and metallurgical processes used in the manufacture of iron and steel, which matter is very interesting, especially that part which alludes to the colonial days of the American Republic. A full list of iron and steel works is given, with interesting statistics of their several productions and capacities. Glass, lumber and textile fabrics are mentioned in regular order, an interesting report having been furnished by Lorin Blodget. Petroleum necessarily occupies a very prominent portion of the report.

Tables are given showing the employment and various occupations of the various classes of inhabitants. The schedule of tariff of 1883, as affecting the Pennsylvania industries, will be found of especial value to manufacturers. A brief mention is made of the most prominent labor troubles of 1882 in the State of Pennsylvania, with suggestions as to the best system to be adopted for the prevention of such difficulties.

This book also contains a copy of the mining laws of Great Britain. The reports of the mine inspectors of the bituminous coal fields are very full, giving location of mines, with name and address of each inspector. These reports also give accounts of the various accidents that have occurred during the year, with causes, etc. The location of and forms of mine bottoms are clearly shown by means of suitable maps and engravings.

On the whole, this is one of the most valuable reports yet published.

Each succeeding issue of the *Fireman's Herald* shows an improvement over previous issues. The *Herald*, as implied by its name, is especially devoted to the interests of firemen everywhere, and ought to be appreciated by the class to whom it addresses itself. A perusal of its columns will keep those interested in fire matters informed of what is going on in the way of improvement around them, and ought to assist in improving the efficiency of fire departments. It is published every Thursday at 173 Broadway, New York.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(213) J. F. R., Huntington, W. Va., asks: If a locomotive is rolling down grade and the reverse lever is thrown into the center notch, will not the travel of valve be equal to the lap and lead? *A.*—The travel will be equal to the sum of the laps and leads; that is, the port will be opened an amount equal to the lead at mid-gear.

(214) X. Y. Z., Allegheny, Pa., asks: Will you please explain the hieroglyphics usually found on the blades of carpenters' squares? *A.*—We could not do this without seeing the particular square you may have in view; perhaps not then without considerable investigation. Such tools are generally wonderfully marked. They are usually marked for board and timber measure, and for various other purposes, some of them useful and others of doubtful utility.

(215) H. L., Huntington, Pa., asks: 1. What is the best substance to use for making the screwed joints of iron gas pipe, and what is the objection to the use of red lead? *A.*—A mixture of white lead ground in linseed oil with about an equal quantity of red lead is very good. Red lead and oil are sometimes used, but this latter mixture is not so much in the nature of a paste as the former, and does not lubricate the threads so well. 2. How are wiped joints made? *A.*—See AM. MACHINIST of Nov. 4, 1882.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

James W. See, Consulting Engineer, Hamilton, O.

A. Wilkinson, expert steam engineer, Manayunk, Philadelphia, Pa.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 42,) New York City.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, 25" lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Consulting Engineer and Mechanical expert, C. C. Hill, 144 LaSalle street, Chicago, Ill.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Wanted—The address of parties who build machinery for the manufacture of matches. Address Match, care AM. MACHINIST.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

H. E. Penney, manufacturer of Steel Spring Cushioned Helve Hammers. Photo and circular on application. Minneapolis, Minn.

New tool chest, price $10. See description in AM. MACHINIST, April 14th, or send for circular. Goodnow & Wightman, 176 Wash'ton st, Boston, Mass.

Castings furnished for 18" and 21" swing engine lathes. Gearing turned and cut if desired. C. F. Batt, Phœnixville, Pa.

How to reach 40,000 prominent "*Steam Users*" in the United States. Send for our circular. The J. N. Mills Publishing Co., 145 Broadway, N. Y.

Speed and drill lathes, 10"x4', new design. Self-clamping rest, first-class material and work. Parties about to buy will do well to inquire. C. Wing, Greenfield, Mass.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton street, New York.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant. $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on personal application. E. E. Roberts, 107 Liberty St., New York City.

Cheapest, strongest, most simple, compact, durable, effective and economical steam pump in the market. See list of prices in this column next issue. No machinery, no oil, no special care. Can be worked suspended by a chain. Pulsometer Steam Pump Co., 83 John street, New York.

We will pay 25c. each for copies, in good condition, of the issues of January 1st and January 8th, 1881. Those sending us either of the above dates will kindly write their name and address on the wrapper for identification. AM. MACHINIST Publishing Company, 96 Fulton street. N. Y. City.

Wanted—Correspondence with engine builders, boiler makers, and supply dealers in steam goods. We manufacture the *cheapest* Injectors and best Steam Jet Pumps in this country, and offer to *live men* the most liberal terms ever named. Drop postal for particulars to J. B. Sheriff, Son & Co., 68 Water St., Pittsburg, Pa.

For a strictly first-class automatic engine, from 10 to 60 horse-power apply to the Straight Line Engine Company, Syracuse, N. Y.; medium or high-speed; perfect balance; fewest parts and fewest working joints; uniform speed at all ranges of power or steam pressure; the best material and workmanship in all vital parts; the most correct distribution of iron; unexcelled in smooth running.

Now ready for delivery, volume 5 of the AMERICAN MACHINIST, comprising the year 1882, (52 issues) complete with index, in substantial book form. Also a few remaining of volumes 3 and 4 comprising the years 1880 and 1881, can be sent anywhere by express. Price of each volume, $4.00; express charges to follow. AMERICAN MACHINIST Publishing Company, 96 Fulton street, New York City.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

MANUFACTURES.

A $1,000,000 cotton factory is talked of at Fort Worth, Tex.

A new screw company is organizing at Holyoke, Mass., with a capital of $100,000.

M. R. Conway, Cincinnati, Ohio, has lately gone into the business of building engine lathes.

The Rochester & Pittsburgh Railroad Company has decided to locate its shops at Bradford, Pa.

The Pittsburgh, Cleveland & Toledo Railroad shops will probably be located at Youngstown, Ohio.

A new woolen mill is in contemplation at Hartland, Me. The company will start with a capital of $50,000.

Currier & Snyder, Worcester, Mass., are about to bring out a new 26" drill of the same style as their 24" drill.

An effort is making to establish at Edgefield, S. C., a cotton-seed oil mill, $1,500 having already been subscribed.

The cotton mills at Anniston, Ala., have just shipped 1,000 bales of goods to China and have orders for 600 more.

The Falls Rivet Company, Cuyahoga Falls, Ohio, are now said to be the largest manufacturers of iron rivets in the United States.

D. A. Bullard & Sons, Schuylerville, N. Y., have put in the grate-bars made by the Salamander Grate-Bar Company, New York.

The Edison Electric Light Company, New York, have adopted the Curtis Pressure Regulator for their engines driving dynamo-electric machines.

W. C. Young & Co., Worcester, Mass., have brought out a very neat boys' foot lathe. Photographs will be sent to any one upon application.

The new cotton mill at Atlanta, Ga., will shortly be commenced. There are nine cotton factories now in Atlanta, having a capital stock of $4,890,000.

The Sandwich Manufacturing Company, Sandwich, Ill., intends to build a two-story brick addition to their machine shop and a foundry, 120x50 feet.

The town of Brampton, Ont., has voted a loan toward erecting additional buildings and machinery for the manufacture of agricultural implements on a large scale.

The new Lehigh Valley Railroad shops at Lehighton, Pa., will comprise three round-houses, each to hold 20 engines, a machine shop 60x100 feet, and a large foundry.

The report that the Diebold Safe and Lock Company of Canton, Ohio, is to erect branch works in Cleveland is said to lack foundation. They have decided not to erect the new works at Cleveland.

The Upton Glue Works, Peabody, Mass., are setting up a Babcock & Wilcox sectional boiler, with the Jarvis furnace. They will use an iron chimney 36" at the base and 42" at top.

The Thurston Sewing-Machine Works are to be removed from Marlboro to New Britain, Conn., the citizens of the latter place having subscribed a liberal amount of the company's capital.

Scannell & Wholey, boilermakers, Lowell, Mass., propose to erect a new shop 114x50 feet. There will be 38 side lights and 26 top or sky-lights. Fifty or sixty men will be employed in the new shop.

The Dutro Car Wheel Company, St. Louis, have put in a 12"×36" Corliss engine, and a boiler 58"×12'. The latter will be set by the Pond Engineering Company, with the Jarvis furnace to burn slack coal.

General Levi Lawlor, of Mobile, and others are forming a company with $200,000 capital to establish at an early day a pig-iron furnace of 60 tons daily capacity at Alpine, Ala., on the Selma, Rome & Dalton Road.

The machinery trade generally is not very brisk just now. An improvement, however, is anticipated in the early fall.

The June Manufacturing Company of Chicago have opened their new shops for making machine screws and machinery. The building is brick, 54x100 feet, four stories and basement. A 55-horse power engine furnishes the power.

Burt & Packard, shoe manufacturers, Brockton, Mass., are enlarging their works, putting in new engine, boiler and building a new chimney. The boiler will be set with the Jarvis furnace to burn screenings, leather scraps, etc.

The Hoyt & Brother Manufacturing Company of Aurora, Ill., intends to build during the coming season another foundry, 80x150 feet, having double the capacity of the present one, and to use the old foundry as a blacksmith shop.

The Phœnix Iron Works, Winona, Minn., are adding a number of improvements to their shops. They are building a new machine shop 30x100 feet, two stories high of brick, and are changing and enlarging some of their old buildings.

The Diebold Safe and Lock Company of Canton Ohio, have under contemplation the erection of a large building 100x250 feet in size, and for this purpose purchased over two acres of land in the rear of their present shops from C. Aultman & Co.

The *Denver Journal of Commerce* says a quarry of oil stone has been opened near Morrison, Col., some twelve miles from Denver, that furnishes rock fully equal to the Eastern article, and can be worked for a nominal price. The stones can be cut and polished and sold at a profit for 10 cents each for the most common size and shape.

We have received a 126 page "preliminary catalogue" of the Cummer engine from the Cummer Engine Company, Cleveland, Ohio., (Hill, Clarke & Co, of Boston, Eastern agents.) The engine is fully described with detail engravings and indicator diagrams.

The Haxtun Steam-Heater Company of Kewanee, Ill., expects to build a shop 150x60 feet, two stories brick, in which they will place $30,000 worth of machinery for the manufacture of steam brass goods, this being a new branch of their business.—*Industrial World.*

The Missouri Malleable Iron Company of St. Louis have decided to increase their capital stock from $50,000 to $100,000. They will also gradually increase the capacity of their already extensive works—it being their intention to make them the largest malleable iron works in the United States.

In a few days work will be commenced on the new shops to be erected by the Pennsylvania Railway Company in Columbus, Ohio. About $1,000,000 will be expended in their construction. When completed they will constitute the central shops of the Pennsylvania system west of Pittsburgh.

The wheels of a new locomotive which has just been built at Salt Lake City were cast from pig iron made at the Ogden Iron Works, and hence are strictly a Utah production. The framework of the engine was forged in those shops, and the locomotive represents Utah labor and skill and partly Utah material.

The location of the Georgia Pacific Railway shops at Birmingham, Ala, is a matter of boast by the press of that city. Atlanta was the rival of Birmingham in bidding for this industry, and the result of the contest "is but another evidence of the fact that Birmingham is to be a great manufacturing city and railroad center."

The Springfield Malleable Iron Company of Springfield, Ohio, is increasing the capacity of its works fully 50 per cent. It is putting in one additional air furnace, three annealing ovens and a moulding-room 100x75 feet, which will give it a capacity of 3,500 tons of iron a year. These improvements will be finished about June 15, and then the company will employ 250 men.

Wm. F. Crawford, of Gisborne Brewery, Lowe street, Gisborne, Poverty Bay, New Zealand, sends us a request, asking for catalogues of the best manufacturers of brewers' plant and machinery, ærated water machinery and freezing machinery. Doubtless our American manufacturers will be able to meet not only the wants of Mr. Crawford, but of all New Zealand, in these directions.

We hear of new enterprises in the line of cotton mills, particularly at the South, where those mills already established are fully employed and reaping good profits upon their manufactures. Though now mostly devoted to the manufacture of yarns, they are looking to advancing to finer goods. The mills are generally managed by Northern men, who have been selected through their thorough knowledge of the business and their individual enterprise.—*Textile Manufacturer.*

The Bullard Repeating Arms Company intends to erect, either in Springfield or Worcester, Mass., a building 168x40 feet, and four stories high, with a tower at one end. This building will give facilities for working 200 men, the company having orders enough to employ that number, and leave a space for a 120 feet addition on the other side of the tower when the business shall require it. Nothing is settled yet as to location. Springfield capitalists are working hard to secure it. The company expects to have its buildings erected and ready for occupancy in September.

Machinists' and Engineers' Supplies.

NEW YORK, May 31, 1883.

The supply market has undergone no special change since our last report.

Iron and the other metals continue quiet with prices same as last week.

The Ashcroft Manufacturing Company, 111 Liberty street, New York, have just issued a new circular of the Moscrop Continous Recorder, described in the AMERICAN MACHINIST some time since.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A mechanical draughtsman wants a situation. References. T. S., care AM. MACHINIST.

Wanted—A first-class mechanical draughtsman desires a situation for the summer. Address A. R. Nuncio, South Bethlehem, Pa.

Draughtsman—A young man is wanted as draughtsman in a machine shop. Address, Machine Shop, box 49, Indianapolis, Ind.

Wanted—By a first-class machine pattern-maker situation near South Norwalk, Conn. Address Pattern-Maker, Box 379, South Norwalk, Conn.

Wanted—Situation as general machinist, on machine tools preferred, by young man having four years' experience. Address W., care AM. MACHINIST.

Wanted—Position by a M. E. and draughtsman in a manufacturing establishment; first-class references. Address, Box 8, AM. MACHINIST.

Wanted—Man who understands making mandrels, and turning all kinds of furniture springs. Give reference and experience. Address, A. B., P. O. Box, 3621, New York.

Wanted—Strictly first-class foundry foreman with knowledge of stove work, jobbing and bench. Liberal salary. State age, experience, wages expected; also hardware pattern makers. J. Smart, Mfg. Co., Brockville, Canada.

Wanted—One first-class foundry foreman, one who is accustomed to wood-working machinery preferred. Good wages and steady employment to a reliable man. Reference required. Also two good moulders. Address, W. P., Box 10, care AMERICAN MACHINIST.

Wanted—Situation by a man with 19 years' experience in cabinet lock business; good draughtsman; well up in tool and die making; also press and key work; well qualified to start new enterprise. Reference furnished on application. Address Box 68, Geneva, O.

Wanted—Blacksmith Foreman—A really first-class man with experience of agricultural work and management of men; a knowledge of plough making and getting out of plough and cultivator steels desirable; good wages and permanent position to the proper man. Address Vulcan, AM. MACHINIST office.

Wanted—A thoroughly competent practical mechanic who understands steam-engine, boiler, foundry and general machine work, as superintendent of large shops; must be a man of experience and thoroughly up on working modern tools Address P. O. Box 2132, New York City, stating experience and giving names of references. All communications will be considered as confidential.

Light and fine interchangeable machinery to order. Foot and power lathes; slide rests, &c. Catalogue for stamp. Edwd O. Chase, Newark, N. J.

Wanted—Special machinery and tools for manufacturing hangers, shaftings, pulleys and couplings. Send estimates and catalogues, W. H., care AM. MACHINIST office.

Wanted—14, 16 or 18 inch swing lathe, short bed, screw cutting. Address giving price and particulars whether new or second-hand, Bailey Mfg. Co., Owosso, Mich.

Wanted—Some manufacturing concern used to fine work to build a patented machine for making hosiery. For particulars address A. J. Close, 32 King street, East, Toronto, Canada.

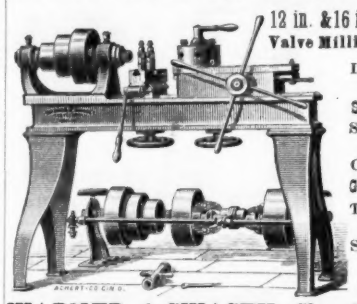
Wanted—Special machinery to manufacture; have pattern shop, foundry and machine shops; parties having machinery made by contract will find it to their advantage to correspond with us. Shultis & Co., Kingston, N. Y.

For Sale—One-half interest in a good machine shop, located in a splendid town of 10,000 inhabitants. Machinist or foundryman, with $3,000 ready cash, will find it to his interest to investigate. Address, box 2,045, Ottawa, Ill.

Wanted—A man with a small capital (from $3,000 to $8,000) and a large capital of brains and experience in the foundry and machinery or agricultural tool business as a partner in a well-established and paying business on the Pacific Coast. The best of references required before particulars are given. Address "Pacific," care this office.

A first-class chance for business. A machinist or any one having general knowledge of the foundry and machine business, with several thousand dollars to invest, can get an interest and full control in a No. 1 shop, equipped with new tools and machinery. To one having cash and brains and desiring to build up for himself, no better opportunity can be offered. For further particulars address John W. Marsh, Portsmouth, O.

BRASS WORKING MACHINERY.

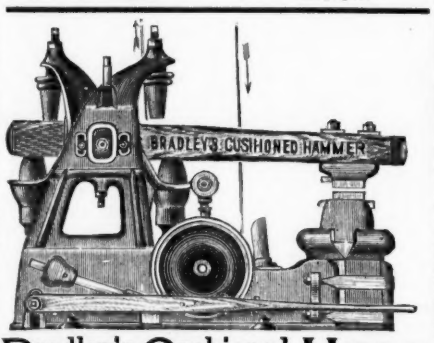


12 in. & 16 in. Monitors
Valve Milling Mach's
Double Key Lathes,
Speed Lathes
Slide Rests
Revolving Chucks for Globe Valves
Two-Jawed Chucks,
Small Tools and Fixtures.

WARNER & SWASEY, Cleveland, O.

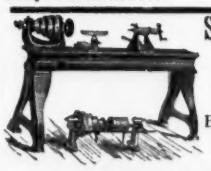
COOKE & CO., DEALER IN Machinery & Supplies,
22 CORTLANDT ST., NEW YORK.

AGENTS FOR THE
Greenfield Vertical Engines
2½ to 30 Horse Power.
Unequaled in workmanship and quality of material. Prices lower than any other first-class engine.
ALSO
SUPPLIES
For Machinists, Railways, Mills, Mines, &c.
Please send for circular and state that you saw the advertisement in this paper.



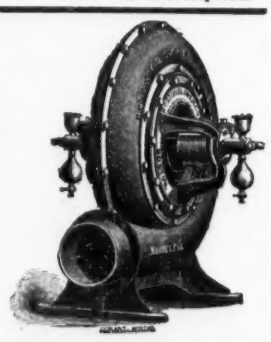
Bradley's Cushioned Hammer
Stands to-day WITHOUT AN EQUAL.
OVER 800 IN USE.
BRADLEY & CO., Syracuse, N. Y.
ESTABLISHED IN 1832.

JOSIAH MACY'S SONS,
189 & 191 FRONT ST., NEW YORK.
Oil Manufacturers,
We make a specialty of compounding oils for high-speed engines and all purposes not in the ordinary line of machinery.
Samples Submitted Free. Established 1832.

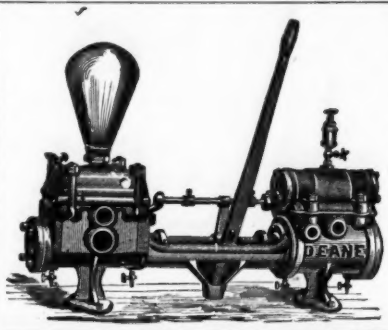


Superior 10, 12 & 16 in.
SPEED LATHES.
Built by FAY & SCOTT, DEXTER, MAINE.
Send for Description.

BOSTON BLOWER CO., BOSTON, MASS.
Blowers and Exhausters OF EVERY DESCRIPTION.



REMOVAL.
GEO. F. BLAKE MANUF'G CO.
HAVE REMOVED TO THEIR NEW QUARTERS,
95 & 97 LIBERTY STREET, N. Y.



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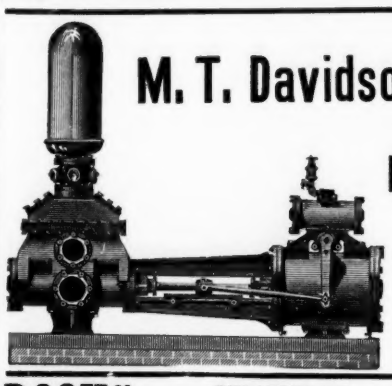
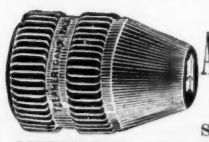
Steam Pumps for Every Service.
Send for New Illustrated Catalogue.
THE DEANE STEAM PUMP CO.,
HOLYOKE, MASS.
92 & 94 Liberty St., NEW YORK. 54 Oliver St., BOSTON. 226 & 228 Lake St., CHICAGO.

UNION STONE COMPANY,
Patentees and Manufacturers OF THE
UNION EMERY WHEEL.
EMERY, EMERY WHEEL MACHINERY AND TOOLS A SPECIALTY.
Automatic Knife Grinding Machines, Wood Polishing Wheels, Grinders' and Polishers' Supplies. Catalogues on application. 38 AND 40 HAWLEY STREET, BOSTON, MASS.



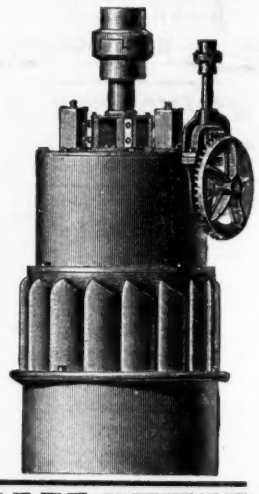
THE
M. T. Davidson Improved Steam Pump,
MANUFACTURED BY
DAVIDSON STEAM PUMP CO.,
OFFICE AND WORKS,
41 to 47 KEAP ST., BROOKLYN, N. Y.
Warranted the Best Pump made for all situations.
KELLY & LUDWIG, AGENTS,
49 and 51 North Seventh Street, Philadelphia.

BOOKS —RELATING TO— Steam Engines, Machinery, Heat, Gas, Electricity, Casting and Founding, &c.
DESCRIPTIVE CATALOGUE, 100 PAGES, 1883, SENT FREE ON APPLICATION.
E. & F. N. SPON, 35 Murray St., N. Y.



THE
American Drill Chuck
Is the cheapest 3-parallel Jaw Chuck. Price, $4.
Sold by all Tool Dealers.
BREHMER BROS., 440 North 12th Street, Philadelphia, Pa.

THE HERCULES TURBINE
Gives more power for the same size, also better average results from full to one-half gate than any other water wheel ever made. It is moderate in cost, compact in form, and not liable to get out of order.
—BUILT BY—
THE HOLYOKE MACHINE CO.
SHOPS AT
Holyoke and Worcester, Mass.
Send for Catalogue, Circulars and Price List to either of the above places.



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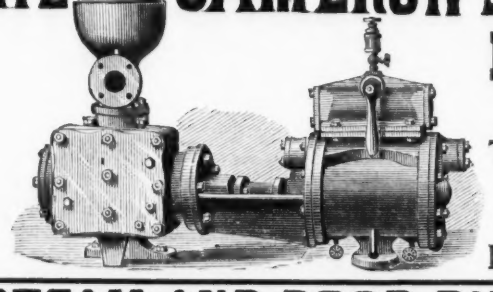

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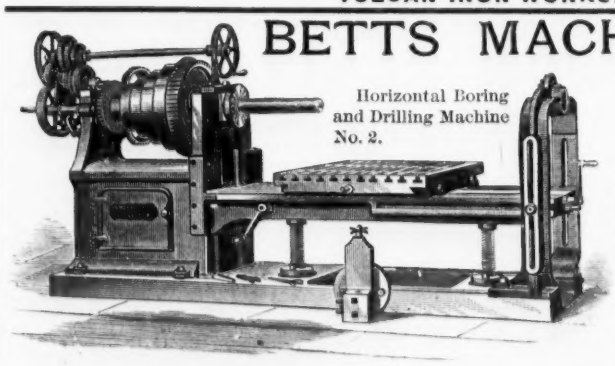

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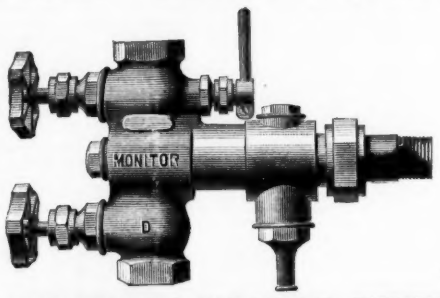

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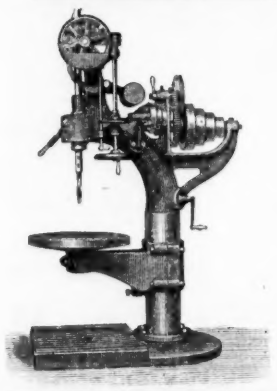

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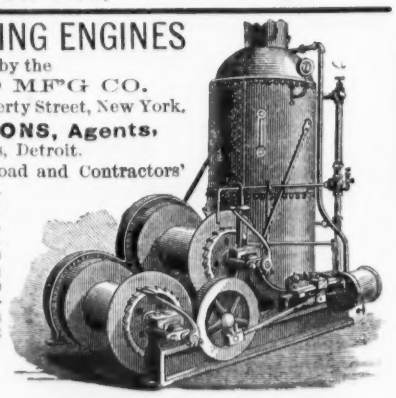

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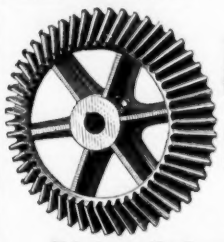

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" 7	1 1-8 "		.95
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" 10	1 1-2 "		1.10
" 11	1 3-4 "		1.25
" 12	2 "		1.40
" 13	2 1-4 "		1.60
" 14	2 1-2 "		1.60
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Full set, 19 Dogs,			26.35
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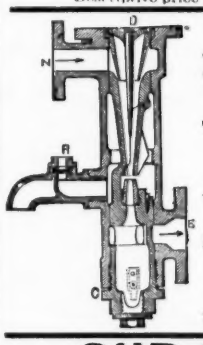

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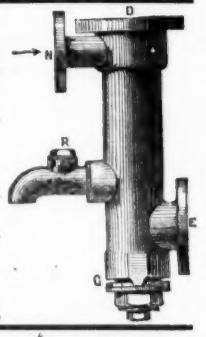

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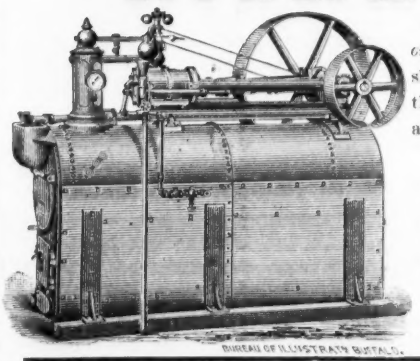

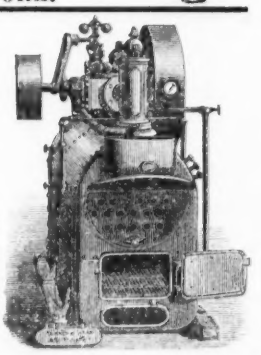

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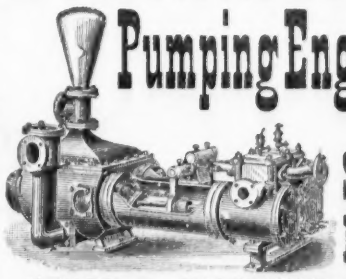

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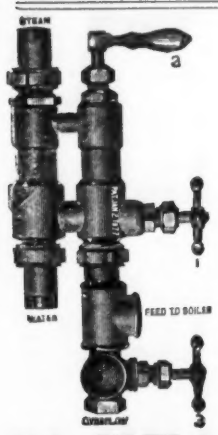

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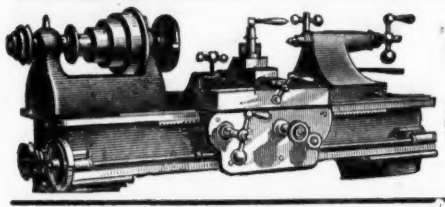

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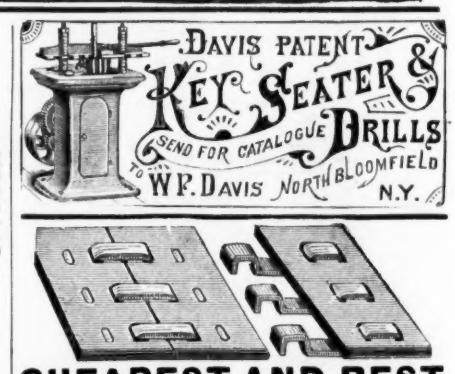

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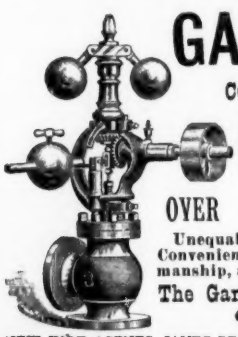

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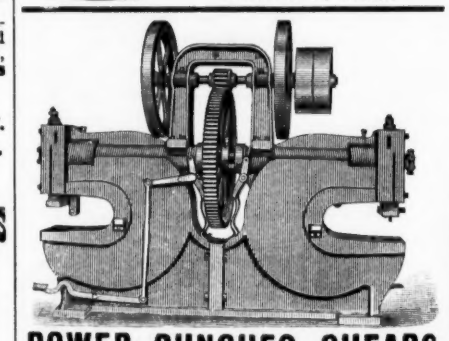

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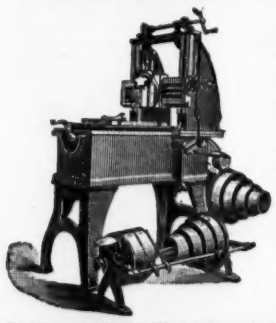

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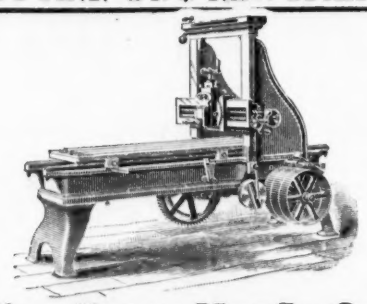

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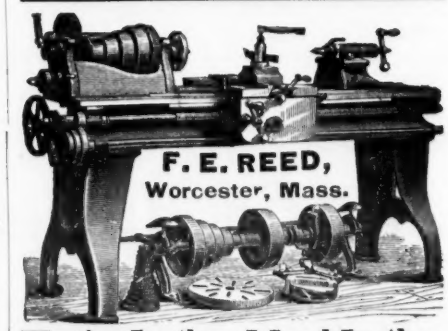

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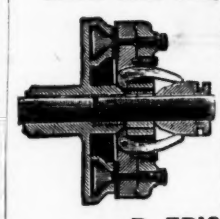

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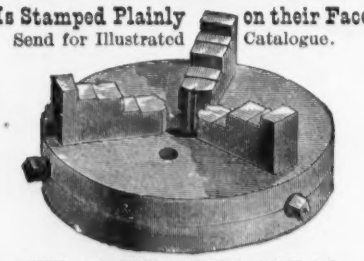

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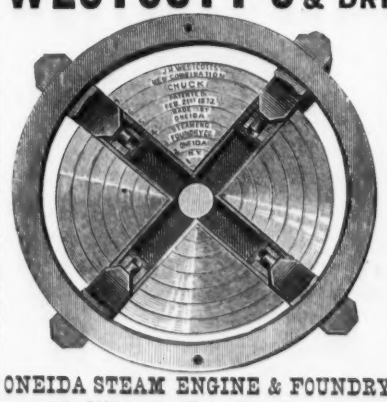

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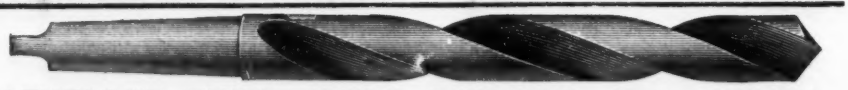

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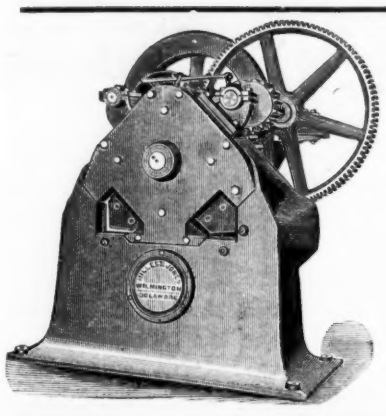

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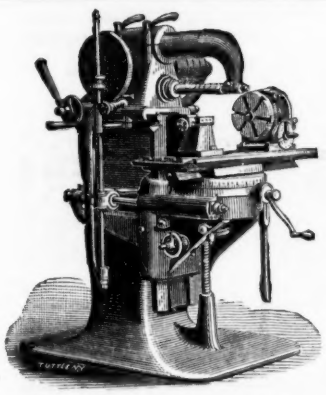

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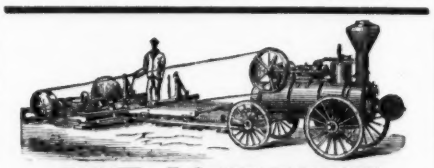

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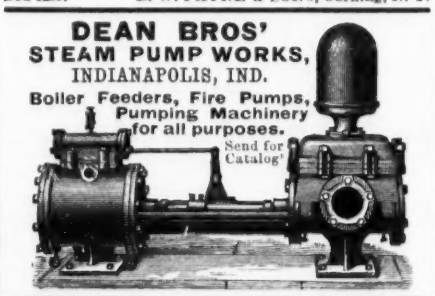

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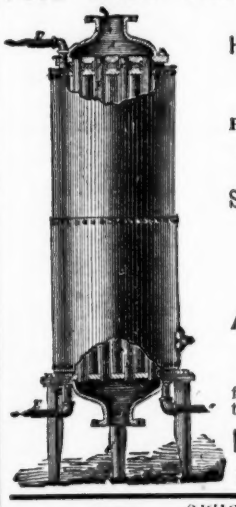

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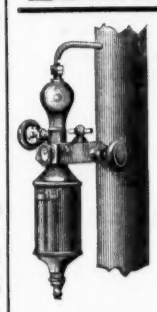

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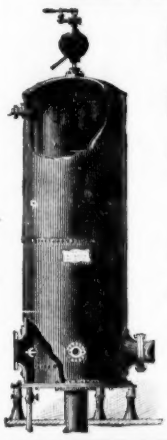

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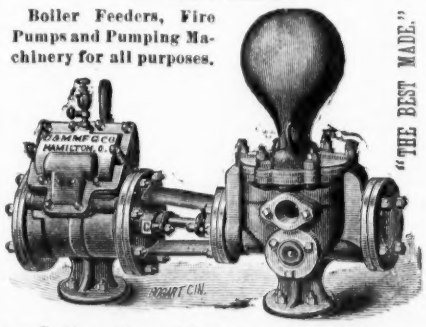

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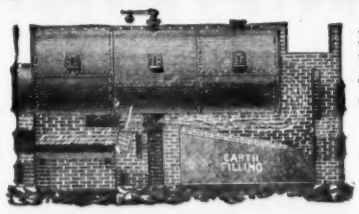

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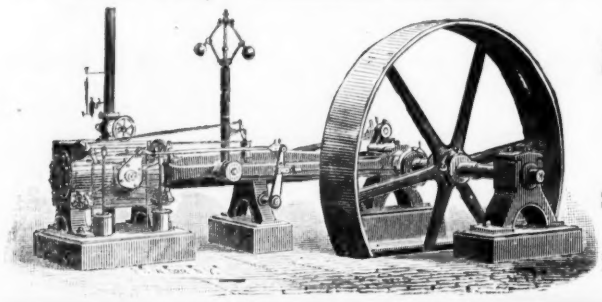

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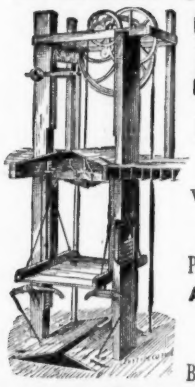

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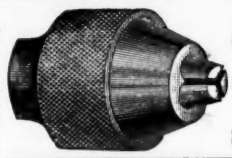

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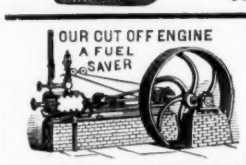

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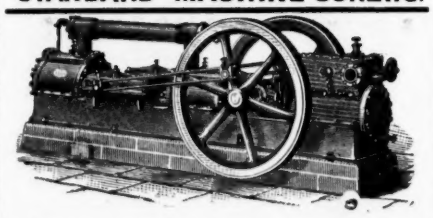

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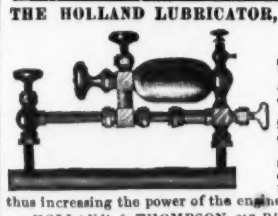

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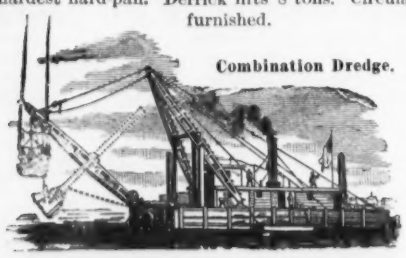

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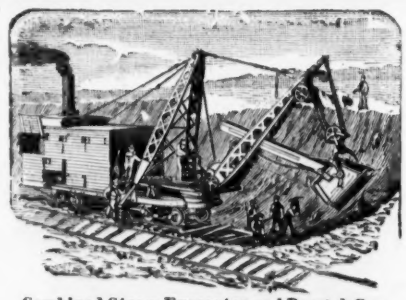

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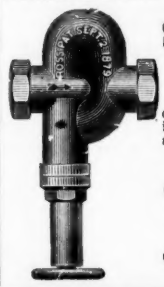

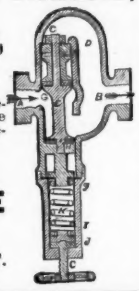

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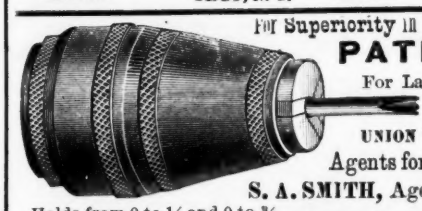

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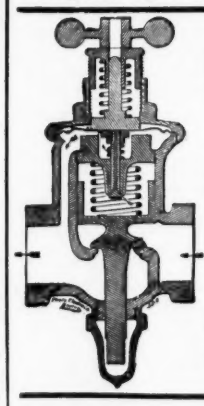

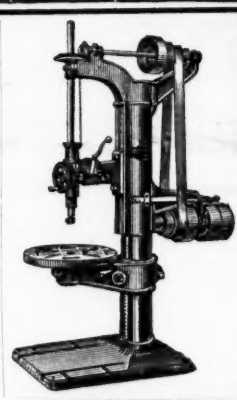

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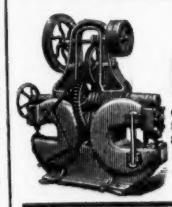

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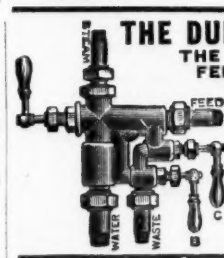

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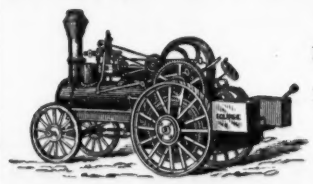

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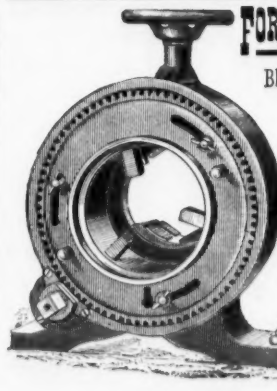

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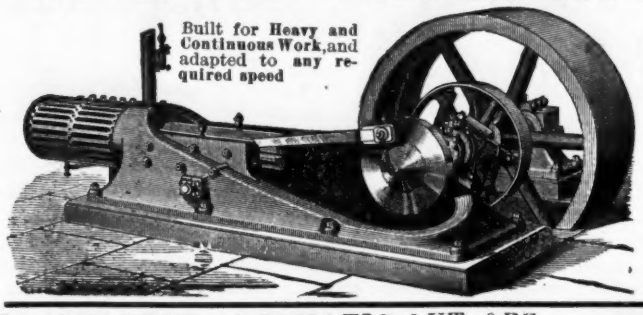

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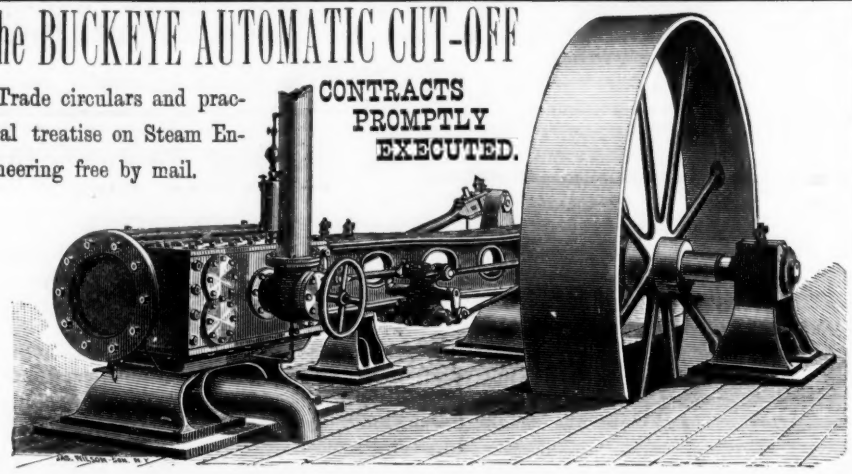

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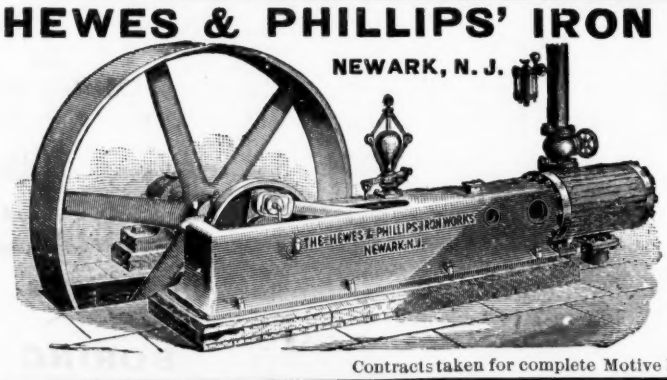

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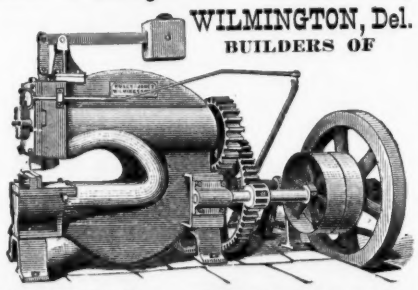

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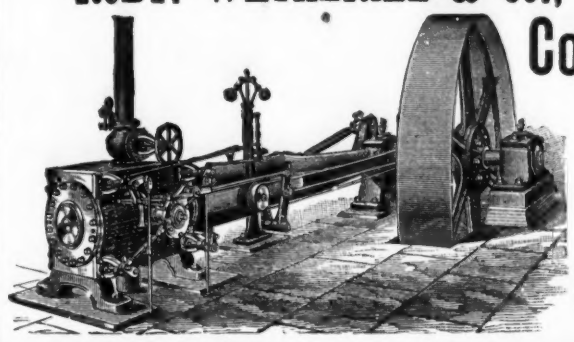

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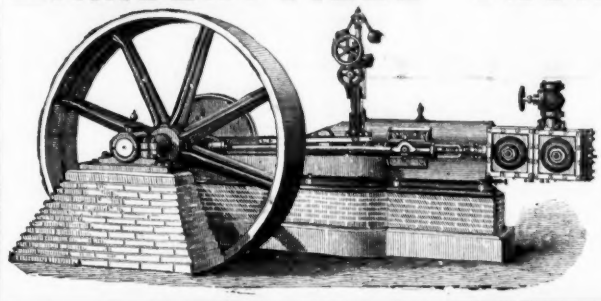

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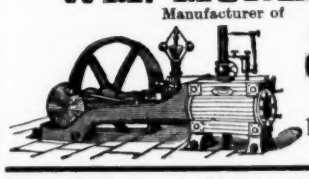

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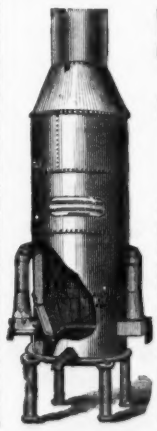

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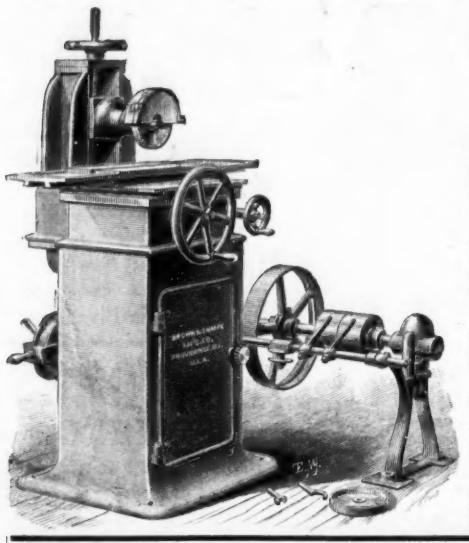

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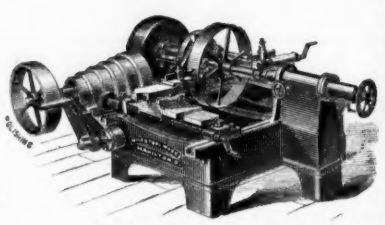

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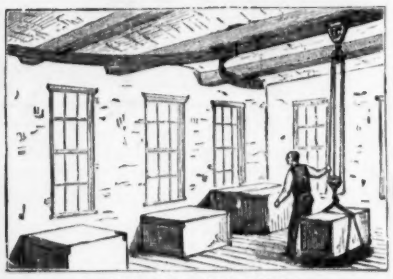

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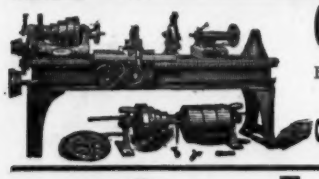

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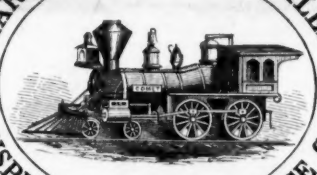

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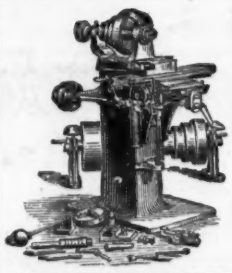

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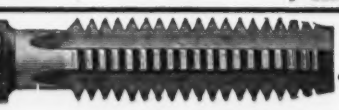

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